

*INTELLIGENCE
TESTS
AND SCHOOL
REORGANIZATION*



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INTELLIGENCE TESTS AND SCHOOL REORGANIZATION

BY

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Many superintendents administer intelligence tests the first time merely to find out the general condition of their schools. No immediate follow-up is planned. The first results are always interesting and almost invariably stimulate the superintendent to inquire into the causes of the conditions found and to seek to remedy them. This book shows the conditions in typical school systems and describes certain methods of correcting common faults in school organization through the use of intelligence tests. It affords valuable suggestions to administrators who seek scientifically to reorganize their schools

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PREFACE

THIS book is in no sense an inventory of the important experiments now going on in the United States in connection with the use of intelligence and educational tests. Such an inventory would have required entirely too much space and would have involved an amount of repetition which could not have been other than tedious. Instead, experiments have been selected which are typical of the leading methods of readjustment now being attempted in different parts of the country. All of them illustrate important types of procedure, but involve varying degrees of generality. At one extreme is the Oakland plan, described by Dr. Dickson, which affects the entire school enrollment and the entire administrative system. At the other is the work of Dr. Fernald, which concerns itself primarily with individual cases of maladjustment and has to do with pedagogical method rather than school organization. Between these extremes is the Los Angeles work, described by Dr. Sutherland. The latter, although originally intended to meet the needs of individual misfits, has resulted in the working out of methods of individual instruction which appear to have applicability with children in general. The chapter by Dr. Franzen illustrates in a most interesting way how the results of intelligence and educational tests can be combined so as to serve as a better basis for rating the performance of pupils and the efficiency of schools. The chapter by Superintendent Tupper shows how much can be done, even in a small city and without elaborate reorganization, to improve the classification of children.

Progressive educators are no longer interested in ar-

guments regarding the validity of the test method. "After tests, what next?" is now the question that is causing deepest concern.

It is hoped that the experiments herein described will have suggestive value, at least for all who are seeking a practical solution of the problems of individual differences.

LEWIS M. TERMAN

*Chairman of Subcommittee on Use of Intelligence Tests in
Revision of Elementary Education*

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INTRODUCTION

As chairman of the N. E. A. Commission on Revision of Elementary Education, I asked Professor Terman, in 1919, to accept responsibility for the preparation of a subcommittee report on the value of intelligence tests in school reorganization. It was Professor Terman's understanding that several hundred dollars would be available from the treasury of the National Education Association for the purpose of defraying the expenses of a somewhat detailed investigation of school grading by mental tests. As the expected funds were not made available at a sufficiently early date, certain changes were necessary in the plans of the subcommittee. Instead of an investigation of the entire question, *de novo*, it was decided to offer brief summaries and interpretations of typical experiments already under way in a number of school systems of the country which have for their purpose the adjustment of school methods, curricula, and organization to the individual differences of pupils as shown by mental tests. The result is this little book, which is offered to the educational public in the belief that it will prove of interest and help to the increasing thousands of teachers and school administrators who use mental and educational tests but are often at a loss to know what adjustments to make in the light of their test results.

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INTELLIGENCE TESTS AND SCHOOL REORGANIZATION

CHAPTER ONE

THE PROBLEM

Lewis M. Terman, Stanford University

HISTORICAL

THERE are few if any more significant events in modern educational history than the developments which have recently taken place in methods of mental measurement. The importance of this new psychological tool for the improvement of school administration has been recognized everywhere with a promptness which is hardly less than amazing. Only sixteen years have elapsed since Binet devised his first crude series of intelligence tests, only thirteen since he gave to the world the first real intelligence scale, and only eleven since the first translation of Binet's method was published in America. During the last decade translations and revisions of the Binet scale have been published in practically every civilized country of the world. In this movement America has led. Nowhere else has such extensive practical use been made of the tests or so much research been undertaken for their improvement. In prisons, juvenile courts, reform schools, and institutions for defectives their use has become well-nigh universal.

But the movement has not stopped at this point. Far-seeing educational psychologists and school administrators early realized that the greatest value of mental tests would be found in their application with school

children. This use has grown to include the testing not only of backward or otherwise abnormal children, but also of the gifted and normal. Thousands of teachers have been trained in the use of the Stanford-Binet or group test procedure, and in many school systems all the children have been tested. There is reason to believe that at the present time Binet tests are being given in the United States at the rate of a quarter of a million a year.

The value of intelligence tests was soon so thoroughly demonstrated that the need for a more expeditious method than that of Binet became imperative. Accordingly, methods of group testing were developed which, under the stimulus afforded by army needs in the Great War, were brought to a stage of practical usefulness with unexampled swiftness. Then hardly had the war closed when a revision of the army tests, for the purpose of adapting them to school uses, was made possible by a grant of \$25,000 from the General Education Board of the Rockefeller Foundation. The work was promptly carried through by a committee of psychologists under the auspices of the National Research Council, and the "National Intelligence Tests," designed for Grades 3 to 8, were the result.

Meanwhile numerous psychologists, on their own initiative, were devising and trying out other methods of group testing. By 1921 more than a dozen group tests for the measurement of mental ability had been published. Several of these were designed for use in the primary grades, others for use in the grammar grades, high school, or college. Most of these methods had been modeled after the army Alpha or Beta scales, but some

of them contained ingenious improvements. In general, progress had been in the direction of simplification of procedure in giving and scoring the tests. The aim had been to devise methods which could be safely used by any conscientious and intelligent principal or teacher. This end seems now to have been fairly well attained. Probably a million children in the schools of the United States were given a group mental test during the year 1919-1920. In 1920-1921 the number was probably not less than two millions. We may expect the number to exceed five millions within a few years.

To interpret this movement as but another educational fad, destined to flourish awhile and then be forgotten, would be a serious mistake. The essential facts in the situation do not justify such a view. Intelligence tests have demonstrated the great extent and frequency of individual differences in the mental ability of unselected school children, and common sense tells us how necessary it is to take such differences into account in the framing of curricula and methods, in the classification of children for instruction, and in their educational and vocational guidance. Standardized tests of the school's raw material can no more be dispensed with than standardized tests in agriculture, manufacturing, or medicine. In time, however, we may expect that the limits of their usefulness will be better defined. Some false hopes will have to be dispelled. The over-enthusiastic will gradually learn that not even the universal use of intelligence tests will bring us to an educational millennium. The child is more than intelligence, and education is more than the cultivation of intellectual faculties.

Thus far effort has been devoted chiefly to the improvement of testing technique and to the investigation of the nature and range of individual differences. The results have shown convincingly that the schools of the future will have to take account of such differences, but they have not shown how this can best be done. School reform has lagged behind the advances of psychological science. This is, of course, inevitable. The problems involved are inherently very difficult and are of such a nature that various alternative methods of solution appear to be, from the point of view of theoretical considerations, almost equally plausible. Considerable time will have to elapse before final judgment can be rendered as to the relative value of the various possible methods of adjusting curriculum and methods to the individual differences of children.

The purpose of this monograph, which has been prepared as a subcommittee report of the N. E. A. Commission on Revision of Elementary Education, is to set forth typical mental-test results which will show the necessity of the school's taking account of native intellectual differences and to describe a few experiments which will illustrate practical administrative methods of meeting the situation. These experiments are frankly tentative. They are offered merely for their suggestive value and with no thought that they should be taken as representing ideal schemes of school reorganization.

LACK OF UNIFORMITY IN THE MENTAL ABILITY OF GRADES AND CLASSES

School administrative practice in the United States has set up grade standards of achievement which, not-

withstanding a certain amount of variability intentionally allowed for, are supposed to represent a fair degree of uniformity throughout the country, or at least throughout the schools of a given city, state, or county. However, standardized achievement tests have shown that such uniformity does not exist. It is not uncommon to find the fourth grade in one city accomplishing as much as the fifth grade in another, or no more than the third grade may accomplish somewhere else. In fact, such discrepancies are not at all rare within the same school system, where all the usual precautions have been taken to secure uniformity. When conditions of this kind are uncovered, they are commonly attributed to differences in the efficiency of teachers or to differences in the home environment of the pupils. Intelligence tests have shown that these explanations are usually erroneous and that the condition is really due to differences in the raw material with which different schools have to work. A few illustrations will suffice.

Five first-grade classes in the vicinity of Stanford University tested by Dickson about the middle of the school year yielded the following median mental ages, stated in years and months: 5-7, 6-0, 6-0, 7-2, 7-8. That is, the best class had a median mental age more than two years above that of the poorest class. The best class possessed average second-grade ability, the poorest class about average kindergarten ability. Seven receiving (first-grade) classes tested by Dickson in Oakland, California, gave the median mental ages 5-8, 6-2, 6-4, 6-4, 6-6, 6-6, and 7-0. The median mental age found by Dickson for 56 kindergarten children in

Oakland was 5-10, and that for 112 kindergarten children tested by Miss Cuneo was 5-6. It is evident, therefore, that some first-grade classes are less fitted to do standard first-grade work than some kindergarten classes. Three first-grade classes in the Horace Mann School gave median mental ages 7-4, 7-5, and 7-11. Here the differences within the same school are small, but the first grade of this school as a whole is enormously superior to the first grade as a whole in Oakland or in most other school systems. In Alameda, California, Hubbard tested two fifth-grade classes, one of which yielded a median mental age of almost 12 years and the other a median mental age of slightly more than 10 years. The former had sixth-grade ability, the latter fourth-grade ability. Tests of 29 Oakland classes graduating from the eighth grade yielded class medians ranging from less than average sixth-grade ability to average tenth-grade ability. Similar contrasts appear over and over in the data secured from cities throughout the country in the establishment of norms on the Otis, National, and Terman Group tests. Until grade ability becomes more nearly uniform, it will be unreasonable to expect anything like uniformity in grade achievement.

In view of such facts as those just reviewed it is obvious that the usual custom of standardizing educational tests in terms of grade performance has little to commend it. Grade means too little, or rather it means too many things to justify such a procedure. The grade concept lacks permanency; it is affected by all the shifting influences incident to such unstabilized and unstandardized educational systems as we find at present in this country. Age offers a far more satisfactory and per-

manent basis for norms of school achievement. It is beginning to be recognized that educational tests will have to be re-standardized in terms of age means or medians.

HETEROGENEITY WITHIN A GIVEN GRADE OR CLASS

Lack of uniformity in the median ability of grades and classes would not, if recognized and allowed for, be especially serious. There is nothing in the situation which requires that a given grade should always mean the same thing, either in different school systems or in different schools of the same system. It is only serious when not recognized and when the variability in achievement is attributed to spurious causes. On the other hand, a wide range of ability in the same class is much more serious. In general, children are able to profit from particular instruction roughly in proportion to the degree of mental maturity they have attained. The chronologically old and the chronologically young may and often do need the same kind of subject matter and methods. This is rarely true of the mentally old and the mentally young. A reasonable homogeneity in the mental ability of pupils who are instructed together is a *sine qua non* of school efficiency.

The conditions which mental tests have disclosed in this respect are anything but satisfactory. The extreme ranges of mental ability in three first-grade classes of the Horace Mann School, taken separately, were, in terms of mental age, 2 years 9 months, 3 years 2 months, and 3 years 9 months. The extreme ranges found by Dickson in seven first-grade receiving classes were 2 years 6 months, 2 years 8 months, 3 years, 3

years 2 months, 3 years 2 months, 3 years 6 months, and 3 years 6 months. Those for Hubbard's two fifth-grade classes were 5 years 4 months and 6 years 3 months. In Palo Alto the ranges found within three first-grade classes were 6 years 4 months, 3 years 2 months, and 2 years 4 months; within three second-grade classes, 4 years 9 months, 4 years 11 months, and 2 years 10 months; within two third-grade classes, 6 years 6 months and 4 years 6 months. The range for Proctor's first-year high school pupils was practically 7 years. The ranges disclosed by the National Intelligence Tests in Grades 3 to 8 of Vallejo, California, were in most cases over 4 years for any given grade.

Summarizing, in a typical first-grade class the dullest pupil is likely to have a mental age of 4 or $4\frac{1}{2}$ years, the brightest a mental age of 8 or $8\frac{1}{2}$. If we lump a dozen first-grade classes together, the range is ordinarily from 3 or $3\frac{1}{2}$ years to 10 or $10\frac{1}{2}$. Similarly, a dozen third-grade classes may range from mental age 7 to mental age 13, fifth-grade classes from mental age 8 to mental age 16, and eighth-grade classes from mental age 10 to a point about as high as any intelligence scale will measure.

The overlapping of adjacent grades in mental ability is illustrated in Tables 1 and 2, which are selected as typical from an indefinite number of such tables available.

The condition may be summed up by the statement that, in general, from 20 to 25 per cent of the pupils of a given grade have attained a mental age about as high as the median mental age of the next higher grade, while the lowest 20 to 25 per cent in the same grade are about

TABLE I. OVERLAPPING OF STANFORD-BINET MENTAL AGES IN THE FIRST THREE GRADES OF PALO ALTO, CALIFORNIA

MENTAL AGE	FIRST GRADE	SECOND GRADE	THIRD GRADE
13½	..	..	2
13	..	..	..
12½	..	..	6
12	..	..	2
11½	..	..	4
11	..	2	6
10½	..	4	12
10	2	..	12
9½	..	2	38
9	..	16	40
8½	6	28	24
8	8	38	16
7½	29	26	10
7	44	32	6
6½	40	6	..
6	24	10	..
5½	12	..	..
5	4	..	..
4½	..	..	..
4	..	..	..
3½ to 4	2	..	..

as low in mental age as the median for the next grade below. Usually 5 per cent or more at each extreme, or 10 to 15 per cent in all, are two grades removed from that which is standard for their mental age. The amount of grade overlapping in mental ability is considerably greater in the upper school grades than in the lower, due partly to the fact that the influences responsible for overlapping have operated longer and partly to the fact that as children get older variability as expressed in units of mental age becomes greater.

However, there are two mitigating circumstances

TABLE 2. OVERLAPPING OF NATIONAL INTELLIGENCE TEST SCORES (TOTAL SCALES A AND B) IN GRADES 3 TO 8, VALLEJO, CALIFORNIA, SCHOOLS

TOTAL SCORE	THIRD GRADE	FOURTH GRADE	FIFTH GRADE	SIXTH GRADE	SEVENTH GRADE	EIGHTH GRADE
340	..	..	..	..	..	1
320	..	..	..	..	..	..
300	..	..	..	..	6	9
280	..	..	..	1	11	33
260	..	1	3	12	29	41
240	..	..	6	20	38	20
220	..	5	19	34	46	15
200	..	9	41	40	25	10
180	2	28	44	20	8	2
160	4	39	52	16	5	..
140	12	54	34	3	3	..
120	29	48	18	2	..	..
100	33	19	4	..	..	..
80	55	17	3	..	..	..
60	29	4	1	..	..	..
40	16	1	..	..	..	..
20	5	..	1	..	..	..
0-19	..	..	..	..	..	..

which should be taken into account in the interpretation of data relative to grade overlapping in mental age.

(1) A part of the observed overlapping is spurious, because of the imperfect reliability of intelligence tests. The higher the reliability of the test, the less is the overlapping. Very brief or otherwise unreliable tests greatly exaggerate the overlapping. Kelley has given us a correction formula which allows for scale unreliability: viz., $\sigma_t = \sigma_1 \sqrt{r}$; or, substituting descriptive terms for symbols, *the true standard deviation (that which would be found if the test were practically a perfect measure of the ability or abilities it purports to measure) equals the observed standard deviation multiplied by the square root of the test's correlation with itself calculated from scores of*

the same group of individuals. By the use of this formula the grade overlapping actually observed for any mental or educational test can be corrected to show what the true overlapping is for the abilities tested.

Even when such correction is made, however, the overlapping of adjacent grades is still very great. When we are dealing with Stanford-Binet mental ages, the application of Kelley's formula does not alter the results very materially. In the three Horace Mann first-grade classes the extreme mental age range given by the Stanford-Binet was reduced in one class only from 2 years 9 months to 2 years 6 months, in another class by a slightly greater amount, and in the third class by about 25 per cent, when the mental ages were based on a composite score of the Stanford-Binet, Pressey Scale, Meyer Tests, teachers' ratings on mental maturity, and teachers' ranking in ability to read. Such overlapping as is shown by the Stanford-Binet, Otis, National, or Terman Group tests is, for the most part, genuine.

(2) Granting this, however, it would still be a mistake to assume that no overlapping in real ability is justifiable. There is no warrant for grading all pupils rigidly on the basis of mental age, even if mental age is the most important single factor. A pupil's fitness for a given grade depends in some degree upon his previous instruction, his health, his physical maturity, his industry, and his attitude toward school work. However, when all reasonable allowance has been made for these factors, it is impossible to find warrant for the present miscellaneous scattering of mental ages through the grades. Making every allowance that could be

made, it is doubtful whether in an average school system more than 70 per cent of the pupils are being given instruction which is as well suited to them as would be the instruction in a higher or a lower grade.

INTELLIGENCE TESTS NECESSARY FOR THE DISCOVERY OF DIFFERENCES

The mere fact that such heterogeneity as that noted above exists is in itself evidence enough that intelligence tests are needed to bring them out. Thanks to the industrious work of a few psychologists, the value of intelligence tests as an aid in determining mental ability has been established beyond any possibility of doubt. Those whose work entitles them to an opinion no longer debate the question.

Investigations have gone farther and have brought to light a number of the factors which contribute to the unreliability of estimates of general ability based on ordinary observation. Among these factors are age, industry, physical appearance, personality, and attitude toward school work. For example, investigators are unanimous in finding that when pupils for a given grade are rated for brightness, the older pupils are over-rated and the younger pupils under-rated. This error is not one which can be eliminated by simply cautioning raters to take age into account. The teacher is not aware of the full significance of age in this connection and so cannot take it into account. The influence of industry is hard to eliminate for the reason that the natural basis for the teacher's judgment of a pupil's ability is the quality of his school performance. Since a pupil of very superior intelligence may do mediocre

work, if he lacks sufficiently in application, it is inevitable that lazy pupils will be under-rated. Similarly, the pupil of superior industry is likely to be somewhat over-rated, although errors in this direction are not likely to be as large as errors of the opposite sort. Intelligent appearance, a lively expression, an agreeable attitude and spontaneity in response, all tend to bring about the over-rating of ability; while a placid expression, homeliness, annoying behavior, diffidence, and apparent lack of self-confidence cause under-rating. Annoying behavior and timidity are particularly likely to affect the teacher's judgment unfavorably. Objective tests offer the only available means of checking up the accuracy of subjective impressions.

MENTAL AGE STANDARDS FOR GRADING

In any plan of school adjustment to individual differences questions are sure to arise regarding mental age standards for the various grades. Tentative standards worked out on the basis of 1936 Binet tests of California children are as follows:

TABLE 3. MENTAL AGE STANDARDS FOR THE DIFFERENT GRADES

GRADE	STANDARD MENTAL AGE	MENTAL AGE AT MID-GRADE
I	6-6 to 7-5	7 years
II	7-6 to 8-5	8 years
III	8-6 to 9-5	9 years
IV	9-6 to 10-5	10 years
V	10-6 to 11-5	11 years
VI	11-6 to 12-5	12 years
VII	12-6 to 13-5	13 years
VIII	13-6 to 14-5	14 years
H. S. I.	14-6 to 15-5	15 years

Etc.

The child is expected to start to school between the ages of six and seven years. Although many start later and some younger, the average age in most parts of the United States is not far from six and a half. The expected mental ages figured on this basis would be those given above. The actual mental age medians for the 1936 cases, by grades, were as follows:

GRADE	I	II	III	IV	V	VI	VII	VIII	H. S. I.
Cases tested..	341	189	181	253	226	236	193	180	137
Median mental age....	6-10	7-11	9-0	9-11	11-0	12-1	13-1	14-2	15-4

It will be seen that the medians found agree fairly closely with the expected. Mental age medians reported for the various grades by other investigators are also in substantial agreement with the above standards. Typical findings are shown in Table 4.

As has already been shown, a particular class of a given grade may yield a median mental age far above or far below the standard for that grade as given in Table 3. These standards simply indicate approximately where the medians ought to be, as our schools are graded at present. If our grading system should change, the grade standards also would change. The standards given afford a serviceable basis for estimating the quality of work which should be expected of a given class in a given grade, and for judging the fitness of a grade as a whole, in any particular school system, to pursue the work which is normal to that grade. By use of these standards it is also possible to translate grade

TABLE 4. MEDIAN MENTAL AGES FOUND IN DIFFERENT GRADES

GRADE	NO. PUPILS	REPORTED BY	MEDIAN MENTAL AGE	STANDARD FOR TIME OF YEAR TESTS WERE GIVEN
Kgn.	56	Dickson	5-10	?
Kgn.	112	Cuneo	5-5	?
I	140	Cole	6-6	7-0
I	183	Edmondson	6-11	7-0
I Low	397	Dickson	6-4	6-6
I	171	Kellam	7-0	7-0
I	3 classes	Chassell	7-9	7-0
II	164	Kellam	8-1	8-4
III	178	Kellam	9-5	9-5
I	About 100	Pintner	7-1	7-0
II	About 100	Pintner	8-3	8-0
III	About 100	Pintner	8-7	9-0
IV	About 100	Pintner	10-2	10-0
V	About 100	Pintner	11-0.5	11-0
V	79	Hubbard	11-0	11-0
IX	137	Proctor	15-10	15-6

performance in all kinds of educational tests into age standards. Thus, a pupil whose score in reading corresponds to Grade 4 may be said to have a "reading age" of 10 years; a pupil whose score in spelling is halfway between the standard for Grade 7 and that for Grade 8 has a "spelling age" of $13\frac{1}{2}$ years, etc.

SOLUTION BY INDIVIDUALIZATION OF INSTRUCTION

Solution of the problem of individual differences may be sought in either of two directions: (1) in the individualization of instruction or (2) in the formation of more homogeneous classes for group instruction. It is well to note that, apart from compromises and mixed procedures, these two alternatives exhaust the possibilities.

Until comparatively modern times the method of individual instruction was almost the only one known. It was only natural that this method should prevail as long as education was for the selected few only. It was equally natural that with the growth of democratic ideals and the movement toward universal education the individual method should be replaced by group instruction. On no other basis, at that time, did universal education seem possible.

More recently, however, and particularly in the last thirty years, several notable attempts have been made to modify school procedure in such a way as to individualize instruction without restricting the numbers to be educated. To describe these experiments in detail would carry us beyond our present purpose. They have not met with enough success to give the method any vogue. The difficulties are very great. As long as there must be thirty or forty pupils for each teacher, it is obvious that individual instruction for all is not possible without radical modification both of textbooks and of methods, and the necessary modifications can be evolved only by patient trying out of specially devised procedures.

The Los Angeles Adjustment Plan, for example, hinges largely upon individual instruction, but has been developed primarily for use with special class children. For a description of the Adjustment Plan the reader is referred to Chapter 2.

This and other current experiments in individual instruction will be watched with the greatest interest. Developments in the use of project methods and practice materials and in the standardization of curriculum content according to mental maturity have given an

entirely new aspect to the situation. What formerly seemed impossible may conceivably prove to be not only possible, but feasible.

But even if possible and feasible, is a scheme of purely individual instruction also desirable? The writer does not believe that a dogmatic answer to this question is at present justifiable. The objection usually voiced is that under such a plan the school would lose most of its social values. The question which the objection raises is of crucial importance. Any considerable loss in social and character development would be too big a price to pay for a little improvement in the efficiency of intellectual training. On the other hand, it must be admitted that the supplementation of self or individual instruction by suitable playground experience and by frequent group discussions of general-interest topics partly makes up for the lack of social experience afforded by group study and group recitation. It has often been pointed out that learning, after all, is necessarily an individual matter. A more serious obstacle to the general adoption of completely individualized instruction lies in the fact that it demands greater skill and resourcefulness on the part of the teacher.

SOLUTION BY HOMOGENEOUS CLASS GROUPS

Whether a satisfactory scheme of individual instruction is possible or not, a consideration of present educational trends points to the conclusion that solution of the problem of individual differences is more likely to be found in the gradation of pupils into homogeneous class groups. At any rate, effort is at present chiefly in this direction; for while experiments in indi-

vidual instruction are few and localized, experiments in re-grouping for mass instruction are numerous and widespread. The re-grouping method has the great advantage that it involves a less radical break with current educational practice. Probably a majority of the cities of the country are attempting at least something in this line—the Oakland plan, described in Chapter 3, being perhaps the most thoroughgoing experiment of the kind that has yet been attempted.

The multiple-track plan, which is the most important feature of the Oakland scheme, is of course not new. For a quarter of a century attention has frequently been called to the merits of the multiple-track plans operated in Mannheim (Germany), Cambridge (Massachusetts), and elsewhere. Although the method has met with little adverse criticism and has been widely extolled as a means of reducing the number of "repeaters," it has not been widely adopted.¹ It has been given new vitality and new promise chiefly as a result of advances in psychological methods for measuring individual differences. Intelligence tests have (1) demonstrated more convincingly the extent of individual differences and (2) made it possible to classify children more accurately on the basis of native ability. Also, as a result of their findings we have come to realize the necessity of a differentiated course of study for the pupils progressing along each of the so-called tracks.

It is the conviction of the writer that, ideally, provi-

¹ The Mannheim system, established in 1899, had two fatal weaknesses: (1) approximately 90 per cent of the pupils progressed along the main track, only 10 per cent being cared for by the "furthering" and special classes; (2) the plan lacked adequate provision for children of superior ability.

sion should be made for five groups of children: the very superior, the superior, the average, the inferior, and the very inferior. We may refer to these as classes for the "gifted," "bright," "average," "slow," and "special" pupils. For each of these groups there should be a separate track and a specialized curriculum. The relative numbers enrolled in the five groups would of course vary from place to place. In the average school system of sufficient size (enrolling, say, 2000 pupils in the grades below the high school) a division something like the following might be considered:

GROUP	NO. IN EACH GROUP	REMARKS
Gifted	2½%, or 50 pupils	Two classes, four grades each
Bright	15%, or 300 pupils	One class in each grade
Average	65%, or 1300 pupils	Four to five classes in each grade
Slow	15%, or 300 pupils	One class in each grade
Special	2½%, or 50 pupils	Three ungraded classes

The above is merely a suggestion and is intended to apply only to the strictly average city. In a school population containing an exceptionally large proportion of gifted or very dull children the numbers would have to vary accordingly. In general the percentage who should be cared for in the various groups would probably range somewhat as follows:

Gifted.....	1 to 3 per cent
Bright.....	10 to 20 per cent
Average.....	54 to 78 per cent
Slow.....	10 to 20 per cent
Special.....	1 to 3 per cent

School systems of 500 to 1000 enrollment will of course often have to be content with at most three in-

stead of five tracks, and in some cases may have to get along with only two. An adjustment involving at least two tracks would seem to be feasible even in a village school having only four or five teachers. In this case the teacher would have about half the pupils in each of four grades instead of all the pupils of two grades. In a typical one-room school enrolling seven or eight grades the multiple-track plan does not seem feasible as a formal system at all, although in individual cases some adjustments may be possible. For such schools the main concern should be to promote pupils from grade to grade more strictly on the basis of ability as shown by standardized mental and educational tests.

It cannot be too strongly emphasized that the multiple-track plan calls for a differentiated course of study, as regards both content and method. The working out of such courses is, indeed, one of the most urgent needs in education today. It is easy enough to say that courses for the bright and gifted should be "enriched" and that those for slow pupils should be reduced to "minimum essentials." Exactly what kind of enrichment is desirable for the former, and exactly what the minimum essentials are for the latter, are questions which perhaps cannot be satisfactorily answered at present. However, a book dealing sagaciously with this problem would merit and would doubtless have wide popularity and profound influence.

For the gifted, bright, average, and dull groups, the specialized course should in each case be continuous to the end of the eighth grade, at least, and for the first three groups at least to the end of the high school. For the slow group the curriculum beyond the eighth grade

should be almost entirely vocational. The special group will of course not ordinarily go beyond the fourth or fifth grade. Beyond suggesting that the curriculum for these pupils should be made far more vocational and practical than it usually is, the writer cannot enter at present into the problems of "special class" methods.

For the bright, average, and slow groups, the reorganization should hinge primarily upon differentiated curriculum content and methods rather than upon time adjustments. There is no reason why the three main tracks should not, in the large majority of cases, be covered in the same number of years. Naturally a few pupils could be expected to gain or lose a year. The gifted group, on the other hand, should cover the eight grades in six years, or at most seven. For these the number of grades below the high school could very well be reduced to correspond to the number of years adopted as normal for the group. The longer the course the greater will be the importance of curriculum enrichment and method modification. For the pupils of all groups, progress on the multiple-track plan would be continuous. There would still be occasional failures, but the number of repeaters would probably be reduced to a fifth or even a tenth of what it now is.

Finally, it goes without saying that the road for transfers from track to track must always be kept open. A fixed and permanent grouping would not only be repugnant to American ideals of democracy, but also pedagogically unjustifiable. So many factors enter to determine a child's fitness for a given kind of school work, and these factors operate from time to time in such variable combinations, that frequent transfers would be imperative.

SUGGESTIONS FOR THE INTRODUCTION OF A
MENTAL TEST PROGRAM

What pupils shall be tested? The answer is, all. If only selected children are tested, many of the cases most in need of adjustment will be overlooked. The purpose of the tests is to tell us what we do not already know, and it would be a mistake to test only those pupils who are recognized as obviously below or above average. Some of the biggest surprises are encountered in testing those who have been looked upon as close to average in ability. Universal testing is fully warranted, whether considered from the point of view of money cost or labor cost. If we can afford to spend \$50 to \$100 a year for a child's instruction for ten or twelve years, we can surely afford to spend 6 to 10 cents for a test whose results may affect the child's entire educational career. The labor cost is too small to be counted an obstacle, now that satisfactory group tests are available. If the results are properly used, the cost is a negative quantity, for in the long run labor is saved.

Choice of tests. New intelligence tests have recently appeared in such numbers that the average teacher or school administrator is likely to experience a feeling of helplessness in trying to decide regarding their relative merits. However, the number of tests which are really anything like satisfactory from both the scientific and practical point of view is small. It is not within the scope of this report to recommend particular tests, but the following general statements may be made:

1. At present three separate group scales are required in testing Grades 1 to 12: one for Grades 1 to 3,

another from Grade 3 or 4 to Grade 8 or 9, and a third from Grade 7 or 8 to Grade 12.

2. Those who are not thoroughly familiar with the merits of the different tests available for each of these levels should seek the help of some one who knows. The director of educational research in almost any city of considerable size is ordinarily in a position to give unprejudiced and expert advice.

3. Brief tests requiring ten or twenty minutes, even when they show a fairly high correlation with more thorough intelligence scales, are too unreliable to be depended upon for the measurement of individual pupils. The saving in time and cost is too small to justify the risk of doing injustice in a considerable percentage of cases by the use of erroneous scores.

4. The group tests devised for grades below the fourth are much less satisfactory than tests for Grades 4 to 12. When "primary" tests are used, they need to be checked up by a large amount of individual testing. This is especially important in the first grade. When possible, individual rather than group tests should be given throughout the first three grades.

5. Pupils of any grade who test extremely high or extremely low, and pupils whose group test score disagrees materially with school performance, should be given an individual test.

Who shall give and score the tests? Group tests may be given by the school psychologist (or director of research), the principal, or the teachers themselves. Although the procedure for many of the tests is simple enough to be mastered readily by any teacher, it is on the whole more satisfactory to have all tests given by

trained and experienced examiners. When no experienced examiner is available, the teacher should not hesitate to undertake the work herself. Binet testing is of course more difficult, and to do it as it ought to be done requires considerable training. However, countless teachers and principals have attained a fair mastery of the Binet method entirely by their own efforts. Many cities are solving this problem by giving training courses in Binet procedure to selected groups of teachers.

The scoring of group tests may be done by the teachers, provided it is carefully supervised. Scoring done without adequate supervision is certain to contain a large percentage of errors. Additions to secure total score should always be performed twice, preferably by different persons. Copying and transcription of scores should also be verified.

Who shall have access to the scores? Not the public, certainly, and ordinarily not the pupils. In rare cases one may be warranted in letting a particular pupil know his score, but in the long run it is probably wiser never to do so. The child who is inquisitive may simply be told that he has done "well" or "pretty well," etc. If this rule is ever broken, it should be in the case of pupils in the upper grades or high school who test high but lack self-confidence or do not apply themselves diligently.

Nor should the scores ordinarily be given to parents. To keep them from the teachers would be, in the opinion of the writer, to carry secrecy too far. It is always necessary, however, to instruct teachers in the significance of scores and to caution them severely against the

evils of making unguarded remarks about the intelligence of this or that child. It is extremely important that every one who uses scores in mental ability tests should have some definite knowledge of and a wholesome respect for their probable errors. Special instruction on this point should be given.

The use of supplementary data. The test score, instead of being considered infallible, should be taken as the point of departure for further study of the pupil. Educational tests should be used and data should be secured on health, interests, habits, and attitude toward school work. Before the tests are given, ratings should be made of each pupil on quality of school work, intelligence, industry, social adaptability, etc. These may be made on a five-point or seven-point scale. The comparison of such ratings with test results will prove of surpassing interest. One pupil tests lower than he was rated, another higher. Why the discrepancy? In trying to find an answer to such questions the teacher will come to understand her pupils as she never did before.

The Accomplishment Ratio. In this connection use should be made of the Accomplishment Ratio (AR) as worked out by Dr. Franzen (see Chapter 4); that is, the ratio secured by dividing accomplishment age by mental age. At present the value of this device is limited somewhat by the lack of reliable age norms for the various educational tests. When this want has been supplied, as it doubtless will be soon, the AR may become as well known as the IQ. In judging a child's educational performance we need to know how well he is living up to his mental possibilities. The AR tells us this. It is the main function of the teacher to keep the

AR from dropping below 100; that is, to keep the accomplishment level for each child up to the standard for that child's mental age.

Where only grade standards are available for an educational test, these may be converted into approximate age standards by use of Table 3 (page 13), showing the mental ages which normally correspond to each grade. For example, since the median mental age (also median age) corresponding to Grade 3 is nine years, a child who earns a third-grade score in a given educational test may be said to have an accomplishment age of nine years for that school subject. If the child's mental age is ten years, the AR is $9 \div 10$, or 90. If the score on the educational test is somewhere between the norms for two grades, the corresponding accomplishment age is arrived at by interpolation.

As Franzen has shown, an ideal method of school marking would be to give the child his AR in each subject. It is obvious that the usual method of marking by A, B, C, D, E (or 1, 2, 3, 4, 5) does not tell the pupil whether he is doing as well as he could be expected to do, ability considered.

Using the test results. The purpose of intelligence tests in the schools is to make a difference in the educational treatment of pupils, not to furnish amusement to the teacher or to gratify an idle curiosity. Unless the results are to be used, the tests had better not be given. On the other hand, immediate wholesale regrading is not always advisable. Reorganization should take place gradually. The opposition sometimes encountered here and there in putting over a testing program in a city usually melts away under the favor-

able influence of a successful experiment with the tests in one or two schools.

The specific uses which may be made of mental test results are set forth in Chapters 2 to 6. The present writer would urge the widespread trial of the multiple-track plan, adapted according to size of city and according to other circumstances. Merely to give a small proportion of children an extra promotion, while this is well worth while, is to be satisfied with too little. More radical measures must be adopted to reduce sufficiently the mental age range in the instruction groups.

Pupil guidance. The use of the tests in educational and vocational guidance is hardly less important than their use in re-grouping. In fact, the two uses are bound up together. At present vocational guidance is too largely an end process, an afterthought. To be of most value it should be preceded by years of educational guidance. At every step in the child's progress the school should take account of his vocational possibilities. Preliminary investigations indicate that an IQ below 70 rarely permits anything better than unskilled labor; that the range from 70 to 80 is preëminently that of semi-skilled labor, from 80 to 100 that of the skilled or ordinary clerical labor, from 100 to 110 or 115 that of the semi-professional pursuits; and that above all these are the grades of intelligence which permit one to enter the professions or the larger fields of business. Intelligence tests can tell us whether a child's native brightness corresponds more nearly to the median of (1) the professional classes, (2) those in the semi-professional pursuits, (3) ordinary skilled workers, (4) semi-skilled workers, or (5) unskilled laborers. This in-

formation will be of great value in planning the education of a particular child and also in planning the differentiated curriculum here recommended. It will be understood that such figures can only be used as a rough guide, especially since the IQ is not a perfectly accurate measure of intelligence.

The discovery and cultivation of talent. The average school devotes more time and effort to its dullards than to its children of superior ability. The latter are expected to take care of themselves. As a matter of fact, many of them are not discovered. Yet it may be of greater value to society to discover a single gifted child and aid in his proper development than to train a thousand dullards to the limit of their educability or to prevent the birth of a thousand feeble-minded. Investigations show that the brightest children, those who have IQ's above 130 or 140, are usually located from one to three grades below that which corresponds to their mental age. They are not encouraged to live up to their possibilities. Their school work is so easy for them that their wills are in danger of becoming flabby from lack of exertion. How can character develop normally in a child who, during all the years when character is being molded, never meets a task that calls forth his best effort? The school's first task is to find its gifted children and to set them tasks more commensurate with their ability.

In 1921 a survey of gifted children in California was begun under the auspices of Stanford University. It is the purpose of the research, which was financed by a substantial grant from the Commonwealth Fund, of New York City, to locate 1000 of the brightest children

in the public schools of the state, to secure a large amount of psychological, educational, and physical data concerning them, and to follow their careers as far into adult life as possible. This is the first research of its kind ever undertaken, but there is reason to hope that such studies will become less rare.

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CHAPTER TWO

CLASSIFICATION OF SCHOOL CHILDREN ACCORDING TO MENTAL ABILITY

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Guidance, Oakland, California*

EDITOR'S INTRODUCTION

Dr. Dickson wishes it to be understood that the experiment described in this chapter is tentative and incomplete. It has attracted such wide attention, however, that we are glad to be able to offer this brief account of its main features. The editor, for one, believes that the best hope for a satisfactory solution of the problem of individual differences lies in an extension and thorough working out of the Oakland plan. This belief may or may not be correct, but probably all will agree that the plan should be given such trial as will determine once for all its advantages and limitations. (L. M. T.)

CLASSIFICATION IN THE FIRST EIGHT GRADES

THE theory behind annual and semiannual promotions is that pupils can be classified by grades into homogeneous groups and that, when thus grouped, large classes can be handled by one teacher. It is, of course, recognized that pupils of similar ability work better together, and that the larger the classes which can be handled the lower the cost of education will be. However, numerous school surveys of recent years, involving the collection of extensive data on age-grade status, classroom accomplishment, and mental condition of children, reveal the fact that the average school class of a given grade is far from being homogeneous; that, on the contrary, it contains pupils differing so widely in age, accomplishment, and mental capacity that our

Berkeley reorganization in 1920. In both cities progress toward the above goal has been gradual rather than revolutionary in nature. There has been no attempt to force upon all schools a cut-and-dried system, but school after school has dropped into the general plan as the most natural way of working. Various departures are allowed in order to meet the exigencies of different situations. No rule can regulate the classification of a school according to the capacity of pupils to learn; no two schools can be treated exactly alike; the machinery must be subject to constant adjustment. A rule might be stated, "Find the mental ability of the pupil and place him where he belongs, taking careful consideration of his age, former accomplishment in school, health, and any other condition which is known to have a bearing upon his proper placement." To attempt to define what shall be done has a tendency to make for mechanical treatment of children, while what must be kept uppermost is that the individual needs of each child should be met as nearly as possible. The school must come more and more to consider individuals rather than masses or groups. However, for the sake of having a common language by which we may make ourselves understood, administratively, we have attempted to define five general types of classes—accelerated, normal, opportunity, limited, atypical. All of these except the normal classes are termed "Special Classes." These special classes differ from the regular classes in that they are permitted to vary the content of the course of study, or the rate of progress of pupils, or both.

Special Accelerated Classes are for those pupils who

have superior mental capacity. Any group of children moved on together from one class toward a higher group at a rate more rapid than normal is classified under this head.

Special Opportunity Classes are for those children who have good mental capacity, but because of illness, moving about, or other reason are working in grades below where they should be. The purpose of these classes is to give such help as is needed to enable the pupil quickly to take up work with a regular class which fits his capacity and needs.

Special Limited Classes are for children who are so slow or dull mentally that they cannot keep pace with regular class work. The purpose of such classes is to accommodate the over-age, slow pupil, modifying the content of the course of study and the rate of progress so that such pupils may pass up through the grades, getting the most essential parts of the work of each grade and passing on for some training in the upper grammar grades or junior high school before the compulsory age limit is reached. Most of these pupils, if held to a rigid standard of regular grades, would reach the compulsory age limit and pass out into industrial life long before finishing the elementary grades. The maximum enrollment is ordinarily 25 to 30 pupils, as compared with 40 to 50 for the normal classes.

Special Atypical Classes are for children who are found, by actual trial in school work and by mental test, to show such mental retardation that they cannot make satisfactory progress in a regular class with a reasonable expenditure of time and effort. The pupils in such classes usually have a mental retardation of three

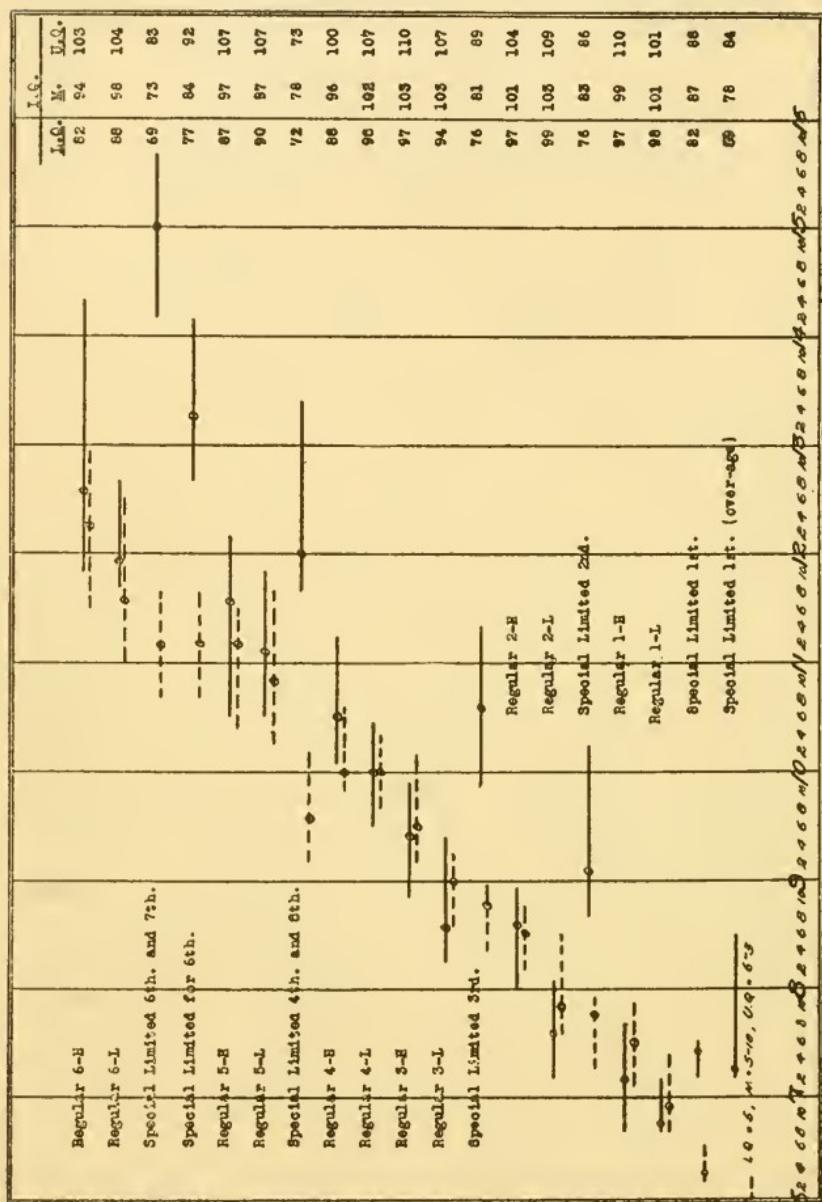
years or more. These classes are limited to an enrollment of 16 pupils. The course of study varies widely from that of the regular classes, manual work being strongly emphasized. It should be noted that the "opportunity" and "atypical" classes are in a sense subsidiary, both belonging in the limited group. The principal of each school, with the assistance of the Bureau of Research and Guidance, organizes the classes in his school so that each child may be placed where he can do best, considering the working conditions of that school, such as the number of teachers, the number of rooms available, and the number of pupils of a given classification.

Following is the working organization of one of our large schools:

The Lincoln School is an elementary school of eight grades, located in the heart of the city. It has 30 teachers, and 1044 pupils of widely varying social classes drawn from an élite fashionable district, from the waterfront, and from an Oriental section. This school has seven special limited classes and one opportunity class. The remaining 22 classes are termed, "normal." A few of the lowest atypical children are sent to a neighboring school which has an atypical class. Superior children are cared for by special promotion and by means of the special opportunity class. In addition, most of the teachers have still further classification within their rooms by making two or more divisions according to mental capacity. Figure 1 shows clearly the general organization of the school (seventh and eighth departmental classes omitted).

Two of the seven limited classes of this school are

FIG. 1. LINCOLN SCHOOL, OAKLAND; SHOWING INTERQUARTILE RANGE AND MEDIAN AGE, MENTAL AGE AND IQ OF EACH GRADE (7TH AND 8TH DEPARTMENTAL CLASSES OMITTED). BASIS SEPTEMBER 1



Basis beginning of term

mental age

chronological age

L.Q. = lower quartile
M. = median
U.Q. = upper quartile

o indicates the median of the distribution

and interest in the work and by adding to their knowledge of the individual child. It has also noticeably decreased the problems of discipline among pupils and has brought about a more delightful school atmosphere both among teachers and among pupils.

The organization of this one school has been described in some detail not because it is considered ideal, but in order to give a fairly concrete idea of how the problem of individual differences has been dealt with in one typical school. In some of our other schools the situation is in certain respects different. For example, if space permitted it would be interesting to describe the organization in the Prescott School, which is a waterfront school having the most serious over-age problem of all the schools in Oakland. This school has 25 normal classes enrolling 965 pupils, and 10 special limited classes with an enrollment of 232. That is, the limited-class enrollment is approximately a fourth as large as that of the normal classes. Contrasting with this is the Claremont School, which is located in an excellent residence district. In this school there are, in addition to 573 pupils in 17 normal classes, 8 accelerated classes enrolling 400 pupils, but only 2 limited classes with a total enrollment of 46 pupils. There is also an opportunity class of 29 pupils. A large proportion of the children in this school save from one half year to two years in the elementary course.

The Lincoln, the Prescott, and the Claremont schools are typical of others in various parts of the city.

The total enrollment of the elementary schools of Oakland at present is 26,647. There are 18 special atypical classes with an enrollment of 288 (1.0 per cent);

57 special limited classes with an enrollment of approximately 1555 (5.8 per cent); and 16 opportunity classes with an enrollment of 303 (1.1 per cent). The special accelerated pupils number 2583 or approximately 10 per cent. These represent only the authorized segregations. Many classes not formally authorized are working according to the general scheme here proposed. Many others would be organized if it were administratively possible. Here the chief difficulty is that of finding sufficient rooms and furnishing a few additional teachers.

The special accelerated classes for superior children are less definitely organized than other classes. Many such classes or groups are to be found in the city, but a consistent effort is being made to keep them from coming into any special prominence. Two plans are being tried out: (1) an enriched course of study with practically normal pace; (2) increased speed with less enrichment of curriculum. By one or the other of these plans approximately 10 per cent of the pupils below the high school in Oakland are receiving some special opportunity due to recognized mental superiority. About 75 per cent of the superior children are making rapid progress, and about 25 per cent are given an enriched program. Many of these pupils are receiving their extra attention as individuals or in small groups through special promotion or through the special coaching that is provided in opportunity classes. Although the above figures show that we are not forgetting the superior child in the classification program which we have set before us, our work thus far is only tentative and we hope soon to be able to make much improvement in the

manner of handling these accelerated pupils and to make special provision for a larger number.

SPECIAL CLASSIFICATION IN JUNIOR HIGH SCHOOLS

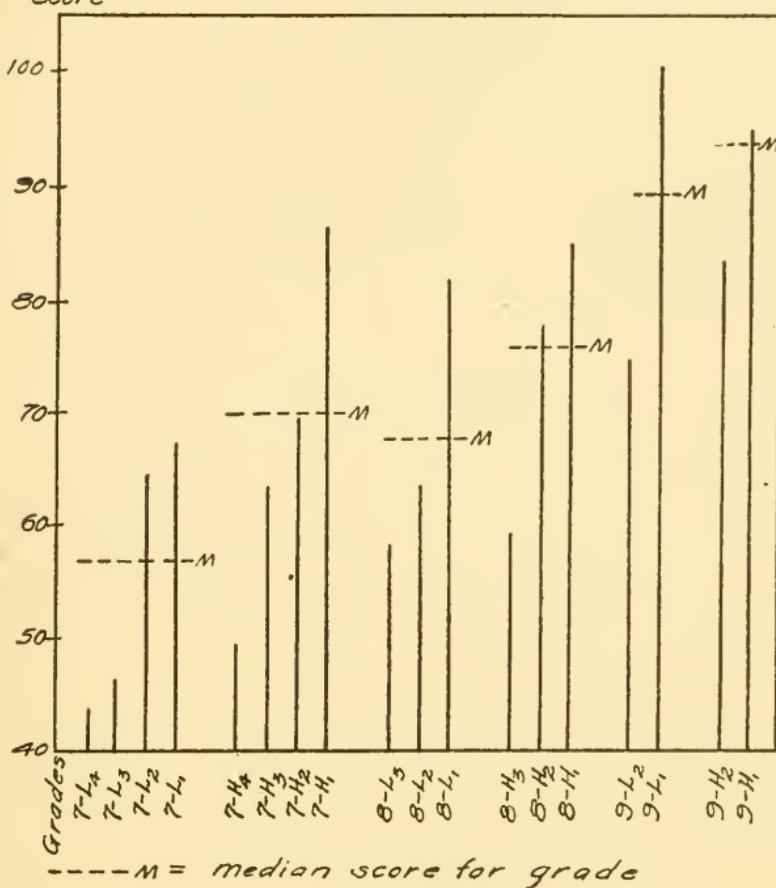
As the classification in the elementary school develops into greater perfection, a large number of over-age pupils with comparatively low mental ability are thrown into the junior high school. This makes it imperative that some scheme of special classification be carried on through the junior high school. Following is an illustration of one of our best classifications in a junior high school (the Edison School, Berkeley). Figure 2 shows the median score—Army Alpha Group Mental Test—for each of the classes of the Edison School. This school accommodates pupils in Grades 7, 8, and 9. In the low-seventh grade there are four divisions: L-7 one, L-7 two, L-7 three, L-7 four, four being the lowest division and one being the highest division. The third and fourth divisions of the L-7 grade are special classes and represent very weak students from the academic point of view. If held to rigid standards of work, some of these pupils would still be classed with fourth, fifth, or sixth grades. All of them, however, are over-age even for the L-7 grade in which they have been placed. They have been promoted into the junior high school because they were past the age of thirteen, chronologically, and had also reached the place where there seemed little if any chance to profit by remaining in the elementary grades. Socially, they belong with the junior high school group, and both socially and intellectually they are misfits in the elementary groups. These pupils are carefully studied

with reference to any special abilities or aptitudes which they have. Whenever it is possible for an individual to show accomplishment that is satisfactory, he is placed in a regular class in any one or more subjects as his accomplishment indicates. He is given special-class development for the rest of his work.

The H-7 grade has four divisions. (See Figure 2.) The fourth division, containing 16 pupils, is very inferior (atypical); the third, containing 27 pupils, is inferior, special limited type; the second, containing 29 pupils, is normal; and the first, with 32 pupils, is superior. The L-8 grade has three divisions. The second and third divisions are very inferior, while the first division is average. For some reason, unexplained at present, the L-8 grade class as a whole seems very inferior compared with the H-7 grade class as a whole. In the H-8 grade there are three divisions, the third being very inferior, while the other two rank normal or above. In the L-9 and H-9 grades there are but two classifications, the second representing those below normal, the first those normal or superior. This figure clearly illustrates the fact well known to all observers, that the pupils of inferior intelligence and those who have difficulty with their academic work in the school are the ones who drop out. While the seventh grade has need for four divisions, the eighth grade has but three and the ninth grade but two. Most of the third and fourth division pupils of the L-7 grade drop out of school before they reach the ninth grade, but, according to former practices in our schools, most of those classified in the third and fourth divisions in the seventh grade would never have reached the seventh

FIG 2. EDISON SCHOOL (JUNIOR HIGH), ARMY ALPHA GROUP TEST

class median score



-----M = median score for grade

CLASS MEDIANS

Class	No.	M. Score	Class	No.	M. Score	Class	No.	M. Score
L-7 ₁	32	67	L-8 ₁	36	81.5	L-9 ₁	35	101
L-7 ₂	29	64	L-8 ₂	31	63	L-9 ₂	30	74
L-7 ₃	27	46	L-8 ₃	25	58	H-9 ₁	39	94
L-7 ₄	16	43.5	H-8 ₁	26	84	H-9 ₂	31	83
H-7 ₁	39	86	H-8 ₂	24	78	—	—	—
H-7 ₂	35	69	H-8 ₃	20	59	—	—	—
H-7 ₃	27	63	—	—	—	—	—	—
H-7 ₄	12	49	—	—	—	—	—	—

GRADE MEDIAN

7L 7H 8L 8H 9L 9H
56.5 70 68 76 89 93

grade at all. The tendency to hold those who formerly dropped out is indicated by the fact that the classification for this school which has already been made out for next term involves adding one more division to each of the grades—a fifth division for Grade 7, a fourth for Grade 8, and a third for Grade 9. The pupils of these limited classes are better prospects for good citizenship because of the year or two of experience with junior high school pupils of their own age, with instruction aimed definitely toward civic and social relationships required of useful members of society.

The first special class for this junior high school was composed of thirteen over-age boys and girls who had low mental test ratings and who were judged by the teacher and principal as unable to profit by further experience in the elementary school. They were taken from Grades 3, 4, 5, and 6. The next term came another special class selected from fourth, fifth, and sixth grades. For five succeeding terms this junior high school has conducted limited classes for over-age, dull pupils who formerly were required to work in Grades 3 to 6. If space permitted, it would be interesting to tell how well most of these pupils did compared with their former records. There is unanimous agreement in our executive and teaching staff to continue and to enlarge this work.

The above description reveals the nature of the pupils who are classified in these special limited classes in the junior high school. The course of study for these pupils varies according to the needs of each particular class. As a matter of fact, the classes are kept very small and the needs of each individual are studied carefully and

are met as nearly as it is possible for the school to meet them. The first problem is to appeal to the interests of the pupil and to his sense of social justice as a citizen of the school and then as a citizen of the community. Opportunities are offered for exposure to manual training, sheet metal work, printing, electrical work, agricultural work, and general science or other vocational or semi-vocational subjects. Sewing, cooking, and home making are strongly emphasized for the girls. Music, including singing, band, and orchestra, has been wonderful as a means of getting a hold on some of these pupils. Each child is urged to develop strongly that work in which he shows good efficiency, and through that field his interests are led into other lines of work which his counselor feels he can and should do.

Just as in the elementary school, so in the junior high school, the removal of special limited-class pupils from the regular classes relieves both the teacher and the class of a great weight. These regular classes are able to do far better work than was formerly possible with the mixed groups. All groups are stirred to better activity by more natural and normal competition. The groups representing superior intelligence cover an enriched program in each subject and many pupils are permitted to carry one or more extra subjects, thus decreasing the time necessary to finish the junior high school course. A few experiments have been carried on in which a superior class has singled out a particular subject—English, for example—and has covered an entire year's work in a half year. It is yet undecided whether, as a policy, it is better to have an enriched program and a larger number of subjects, or an enriched program

and more rapid speed. In any event, there is general agreement that the accelerated pupils shall have an enriched program.

THE SENIOR HIGH SCHOOL

The policy of segregation does not stop with the elementary school and the junior high school. The very fact that we are carrying many of these special limited-class pupils up through the grades means that the senior high school is now receiving a large number of regular day pupils that formerly left school for one cause or another before reaching the high school. These pupils are clearly not capable of carrying the standard course as laid down in our regularly accredited high schools. The senior high school must, therefore, face the problem of furnishing courses of study adapted to the needs of these children and making proper classification for them, or must give them a trial at work which they cannot do, fail them, and pass them out. As a matter of fact, our senior high schools are rapidly adjusting themselves to this new problem, are making classifications according to brightness, and are varying the courses of study as well as offering a large number of electives. The plan of electives, however, has very little real bearing upon our problem. It is just as absurd to classify dull pupils and bright pupils together in shop mathematics as in algebra, in commercial English as in Latin. The high school must classify according to brightness and must offer modified courses of study, or the present standards for academic work will fall.

In such subjects as English, general science, and

mathematics, where several classes are scheduled, some of our high schools have arranged for three divisions, the first division for superior pupils and the third for inferior. The first-division pupils are sometimes given an enriched program and sometimes more rapid promotion, while the third-division classes are given a modified course of study. Also, superior pupils as individuals are permitted to carry a larger number of units of work, thus enabling them to shorten the period required for high school graduation. This extra-unit plan also fails to offer much aid in the solution of our problem. It merely helps to keep some of the brighter pupils more fully occupied. We are now placing on our high schools a new responsibility, that of "educating" a large number of pupils who are of high school age but are admittedly unable to cope with the requirements of the standard high school curriculum.

SUMMARY

The graded system with annual and semiannual promotions has failed to produce homogeneous groupings in our public schools.

The misfits in present grade grouping are due largely to improper classification by mental level and uniform requirements in course of study.

Each school tends to a classification according to the brightness of pupils of that neighborhood. A standard classification is needed for administrative purposes.

The needs of all classes of pupils can be more fully met at little if any additional expense by a multiple-track system adapted to pupils of superior, normal, or inferior intelligence. This system involves differences

in rate of progress through the grades and differences in content of course of study.

The system is more democratic than former systems because it offers to every child a freer opportunity to use his full capacity.

Limited classes keep dull pupils longer in school by giving work better suited to their needs.

Experiments carried on in elementary, junior high, and senior high schools by classifying pupils according to brightness have demonstrated the feasibility of the plan.

Modifications are being worked out for the courses of study, adapting them to a three-track plan, and the operation of the system of classification is being continued and enlarged in the Oakland and Berkeley public schools.

CHAPTER THREE

METHODS OF INDIVIDUAL INSTRUCTION IN THE ADJUSTMENT ROOMS OF LOS ANGELES

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EDITOR'S INTRODUCTION

Those who are acquainted with Dr. Sutherland's Adjustment Room work in Los Angeles agree that he has made a contribution of unusual importance. According to the editor's view its value lies in the demonstration of the fact that much if not all of the curriculum material can be so presented as to make possible a thorough-going system of individual instruction. It is unfortunate that the space limitations of this chapter are such as to make impossible a detailed presentation of the ingenious project material into which Dr. Sutherland has divided up the Los Angeles course of study. For a satisfactory exposition of his methods nothing less than a volume would suffice, and it is to be hoped that Dr. Sutherland will soon find the time to prepare such a volume.

The reader will inevitably ask why methods which have proved so successful with adjustment cases should not prove equally successful with children in general. And why should they not? At any rate, the experiment ought to be made. Even if Dr. Sutherland's plan should not prove universally applicable, there is one presupposition behind it which deserves the strongest possible emphasis; namely, that curriculum material should be thoroughly standardized according to difficulty for the different mental age levels. (L. M. T.)

STUDYING THE CURRICULUM FROM THE STANDPOINT OF THE CHILD

AN unusual opportunity was presented on the occasion of the influenza epidemic in Los Angeles. During this period a group of teachers, assigned to the Department of Psychology, undertook a detailed study of types of

lessons in Grades 1 to 6. The interest then initiated among this group of teachers was sufficient to keep them at work during the next three years. Courses of study of this and other cities were studied and compared and types of lessons were submitted and reviewed with the following question in mind: "What is there about this lesson that has proved to be difficult?" The teachers, being experienced, had no trouble in finding a wealth of illustration. The questions then asked were, "Why is it difficult?" and "How did you succeed in overcoming the difficulty?"

From these meetings there has resulted a course of study in minimum essentials, covering Grades 1 to 6. Each general topic has been divided into particulars, and each particularly difficult lesson or process has been noted.

The Department, which was just then engaged on the task of reorganizing the Ungraded Rooms, pursued this problem farther. For our purpose it was found that the course of study must be presented in other terms. No two teachers could agree as to the exact requirements of this course, or of the other courses of study presented. Attempts to define led to illustration. A particular child needed the subject matter in terms of an objective, and to supply the need the course of study material became far less important than the objectives to which it was applied. The question was asked, "Why not take these illustrations as typical lessons?" When this proposal received assent, another striking fact was apparent; namely, that each teacher tended to prepare lessons similar to others of her own production and different from those prepared by any other teacher. Evi-

dently the children in one classroom are likely to become super-saturated with the "methods" of one teacher. Would it not be well for each teacher to collect from other teachers samples of their lessons and thus be able to present other points of view, other "methods," and other values? These points being agreed to, with the help of the school psychologist the following analyses were made:

- (1) The aim or goal of the pupil toward which each lesson seemed to contribute;
- (2) The mental attitude required of pupil in grasping and applying the concepts involved in the lesson;
- (3) The variety of mental processes involved (analyzing, classifying, generalizing, remembering, simplifying, criticizing, emphasizing, estimating, constructing, predicting).

PRESENTING THE CURRICULUM TO THE CHILD

If it is possible to state the course of study in terms sufficiently clear to be fully comprehended by the teacher, the statement must take the general form of a set of directions as to what the child is to do. When the question of motivation is considered in the same connection, it is only a step to the suggestion that the course of study should be directed to the child instead of to the teacher. This suggestion was adopted at once for the special rooms, and later the form was used by the superintendent of schools in the new course of study for the city.

PRINCIPLES OF GROUPING SUBJECTS AND TOPICS

Questions as to the difference between preliminary studies such as phonics, drill subjects such as number

combinations, and content subjects such as history, were thoughtfully considered and the following conclusions arrived at:

(1) Reading is the fundamental subject. All content subjects must be read. The difference between preliminary reading, reading for reading's sake, reading for literary values, reading for information, and reading for discipline is chiefly in the direction of attention and the mental activity. The reading of arithmetic problems, which occasions so much difficulty, is, after all, reading. And in a general way this process may be classified as receptive (due regard being given to the fact that every act of reception is an action and therefore an expression).

(2) On the other hand, the expression of thoughts, orally and in writing, is psychologically of importance equal to reading. Penmanship, spelling, familiarity with sentence structure, language, and composition are intended to function automatically in the expression of ideas, and must therefore be exercised in this relationship. "Written expression" is the name given to this part of our modified course of study.

(3) Number work of the formal sort is provided for by such devices as those of Courtis and Studebaker. Pupils who have special need for such drills, apart from reading and organizing of numerical values of problems, can receive it.

SAMPLES OF CURRICULUM MATERIAL

The minimum essentials of the course of study are now divided into projects, each with a definite objective and directions which will set the pupil into mental ac-

tivity under the control of a general mental attitude. For each such Project there is a Project Test, which serves for purposes of "placement" of pupils on entering the special room. For each Project there is a group of Practice Exercises, which are sample lessons in the form which will require mental activity of a particular sort (as enumerated above). The Projects of the following list are worked out in detail for each grade, for two levels in each grade, and for a variety of applications at each level:

Reading Projects

- A. How many numbers can you identify (find) per minute?
- B. How many numbers can you pronounce (say) per minute?
- C. How many words can you identify (find) per minute?
- D. How many words can you pronounce (say) per minute?
- E. How many words in sentences can you read per minute?
- F. How much of what you read can you repeat?
- G. How well can you follow directions?
- H. How many numbers can you evaluate per minute?
- I. How well can you define words?
- J. HOW WELL DO YOU UNDERSTAND WHAT YOU READ?
- K. How much of what you have studied can you remember?
- L. How well can you read maps and tables?

On the following page is a sample of Project Test (Reading Test J, Level VI, Part I) for upper third grade. In the left margin the mental processes which that part of the test is supposed to call forth are noted.

*Reading Test J, Level VI, Part I**Project: Reading Comprehension.**Score**Name*.....

<i>Name</i>	<i>Time</i>	<i>Not over 15 min.</i>
<i>Date</i>		
<i>School</i>	<i>Comprehension</i>	

*How much do you know about what you read?**a. Finish these sentences:*

1. Ink is darker than ____.
2. Is the baby awake or *asleep*?
3. They play all day and sleep all ____.
4. Her dress was new, but now it is *worn*.
5. The sand was not wet, but ____.
6. Don't play with eggs because ____.
7. When you paint a picture, the things you need are ____.

*b. Draw lines from the word *cat* to all the things that cats do.**Draw lines from the word *dog* to all the things that dogs do*

	bark	
	eat	
	mew	
cat	scratch	dog
	purr	
	growl	

c. Read this to yourself, and then follow the directions on the other side of this page:

John and his dog stood under a large pine tree at the edge of the rocky cliff. Below, the noisy waves were breaking against the rocks. It made John laugh to hear the dog bark back at them. Hearing a ship horn, John looked out to sea. A fishing boat was coming in. As it came nearer, John could see the fishermen in their bright sweaters and the big nets full of fish.

Tell the things you saw.

Tell the sounds you heard.

d. Finish these sentences:

1. Fish have fins where birds have ____.

2. Fish swim, while kittens —.
3. We use fish to —, we use shoes to wear.
4. A fish in a net is like a fox in a —.

*Reading Test, Level J, Part II**Score*

<i>Time</i>	<i>1 min.</i>
<i>No. correct</i>	

Read each of these examples. Tell how you would do them on the line after each example. Write Add, Sub., Mult., or Div.

1. There are 48 seats in the car. How many seats are there in 6 ears of the same size?
2. 432 eggs are to be put into 3 crates. How many eggs will there be in each crate?
3. If Ford runabouts cost \$485, what will three of them cost?
4. On a cattle ranch there were 673,450 cattle. Because there was no rain, 92,385 died. How many were left?

The following is a sample of Practice Exercise at the same level, for one of the Comprehension Projects. There are fifty of these Practice Exercises at this level, for this particular Project.

Robinson Crusoe, Chapter 14, Reading Level VI, Exercise No. 40
How well do you understand what you read? Reading Level VI J

Read Chapter 14 and time yourself on this exercise.

1. Change these sentences so that they tell the truth:
 Robinson used his first canoe for his trip.
 Robinson was soon out of sight of land.
 Robinson could not find a sheltered place to land.
2. From *trip* draw a line to everything that Robinson took with him on his trip:

umbrella	fishing rod	eanteen	gun	powder
trip				
hoe	rice	blankets	bread	looking glass

3. Fill the blanks:

A steamer is larger than a ——, just as a —— is larger than a baseball.

It is easier to paddle when the sea is —— than when it is rough.

A current moving through the —— is like a wind blowing through the air.

4. Underline the things which helped Robinson get back to land:

A wind	his sail	his gun	his paddle
the clear water		his muscles	

Score

<i>Time</i>	
<i>No. right</i>	

5. Draw a picture of Robinson's boat, as you think it must have looked, or the island as it must have looked from his boat.
 6. Imagine you are Robinson out at sea. This is what you are saying as the current carries you away. For each blank put a word that means *you*:

Robinson's Lament

"Help! Help! —'m drifting out to sea!
 — call; there's none to answer —.
 Oh! little home where — was safe and well
 Oh! little island! what a magic spell
 There falls upon — as —'m torn away
 Helpless, alone, upon the ocean gray!"

How did you feel as you said this?

THE ADJUSTMENT ROOM

Individual differences in physical and mental endowment, in home and neighborhood environment, in home encouragement and restraint, and in ability to make satisfactory school progress under average conditions—all these theoretically receive recognition; but unfor-

tunately helpful detailed instructions for modifying the curriculum so as to adjust it to such differences are too often lacking. In many school systems so-called Ungraded Rooms have been provided, with a teacher in charge who has received training which fits her to administer the course of study only in the usual way. The consequence has been that the ungraded room, instead of giving an exceptional opportunity to pupils, has too often become a threat, a punishment, a catch-all for school problems, and a dumping ground.

The Adjustment Room is different. Imagine a room in which the children are not sitting in prim rows or in good order; where each child is recognized as an individual who is there for a purpose, and who is so busy in developing his own ideas along the lines of the above-described course of study that he feels perfectly free to walk, ask or receive help from another child, consult the teacher, or refer to the list of projects which stretch before him. Imagine a room in which the pupils do most of the correcting and marking and in which the teacher spends most of the time in encouraging, explaining, and restraining (when need be) instead of hearing "recitations" and disciplining pupils. Imagine a room in which the pupils grade themselves, make their own daily programs, and keep graphs of daily progress; where the standard of performance required is 100 per cent as to quality, instead of 70 per cent, and where the standard score as to accuracy and speed of work is also required. Such a condition obtains in the Upper Adjustment Room (Grades 4 to 6), and in the Primary Adjustment Room (Grades 1 to 3) so far as the number of second and third grade pupils will permit. It is usually true

that no two children are working at the same level. Indeed, it is soon found that if two children are started at the same level they will very soon cease to remain so.

SELECTING THE PUPILS FOR AN ADJUSTMENT ROOM

The test of efficient schools is a demonstration of the development of all the abilities which each child possesses. When any child has attracted attention by his failures and is referred to the psychologist, he is examined, not to justify the judgment of the teacher, but to determine wherein his strengths and weaknesses lie. Mental and educational surveys help to direct attention to the conditions existing in any room and are valuable also in pointing out particular children who need help. But it is frequently found that the child who fails on a group test is considered a very satisfactory scholar. The reverse is also true. Individual examinations, both mental and educational, often reveal particular difficulties or complete lack of ability in a child who is rated as satisfactory. Such children, as well as "misfits," are placed upon the waiting list of the Adjustment Room.

THE TRAINING OF THE CHILD

The first step in the training of a child to become independent, to fix his mind upon a definite goal, and to work for achievement, is finding his actual level of development. This is done by "Placement Tests." The real cause of failure of the child may lie far below his present level. The "Placement Test" is simply an individual examination in school subject matter, supplemented by questions or other devices to demonstrate the child's understanding. Speed and accuracy tests in

subject matter also are used and the performance compared with standard achievements. Owing to the number of such children to be examined, a mental test is given only when its need seems to be evident. (When a teacher has become sufficiently familiar with her task, and is accredited, she takes charge of the testing, and in such rooms every child receives a mental test.)

TEACHING THE CHILD TO USE THE MATERIALS

After being "placed," each child knows the number of the project in reading, number, and written expression at which he is to begin his progress. He is shown how to select for each subject the practice exercises which have been prescribed for him, and how to take them to his seat and work upon them until he feels he has mastered them. He times himself, or has some other child time him, if the nature of the practice is such as to require it. He may ask some child who is farther advanced to assist in checking his work in the self-scoring exercises. When he feels he is ready for a test, he goes to the teacher for a project test. If that is satisfactorily completed, he takes from his folder a progress card, on which he records the date at which he passed that particular project. He then goes to the cabinet for the next group of exercises.

MAKING HIS DAILY PROGRAM

From a list of activities on the board, each child makes his own daily program, which is scrutinized from time to time by the teacher. If he is particularly weak in number combinations, he will devote a larger amount of time to that subject. If he is weak in arithmetical

reading, he can secure an extra amount of practice in that field. But each child's program will include some study in each branch.

CLASS EXERCISES

Each teacher has been encouraged to modify her daily program to suit the needs of the children. She is urged to devote at least one fourth of the day to group exercises such as group speed practice in arithmetic, oral English, etc. Aside from this, the child spends his time in supervised study. Instead of spending one twentieth of the time (in a class of twenty) in recitation and nineteen twentieths of the time in attending or not attending to what is going on in the class, he spends twenty twentieths of his time in an active effort to improve upon his record of yesterday. He competes against himself instead of against some other child of superior or inferior mentality. He has an opportunity to create a mental environment of his own, mental habits and attitudes of his own, and is held back by no one else. He is at all times working for a definite goal which is within his comprehension. He secures an immediate reward for increased ability in his satisfaction upon recording another step of progress. (Some teachers have the pupils keep this record, in colored crayons, on the board.)

AS AN OBSERVATION ROOM

Under such conditions it is at once possible to note the laggard, to detect particular kinds of difficulty, to watch the different varieties of temperament, and to discover the presence of many hidden factors which deter the pupil. Physical handicaps, ranging from weak

eyes and bad habits of respiration to constitutional weakness and inferiority, soon come to the surface. While an effort is made to keep from the room all children who show evidence of serious physical disability or feeble-mindedness, the room has been used as a place in which any child can try himself out when there is any doubt of his ability. Children believed to be feeble-minded by both teachers and parents have proved not to be so. There is a constancy about the conditions which makes it easy to judge of the real abilities of the children, in contrast with the variable conditions and the lack of personal contacts in the ordinary classroom.

AS A ROOM FOR EDUCATIONAL THERAPEUTICS

"Diagnosis is half the cure." The mind which is unfolding its abilities naturally and fully is rare. As the results given later will show, the child who is backward or a misfit, provided he is not clearly feeble-minded, can often make rapid progress when he is given proper incentives and shown the way. More frequently than any other cause, a lack of confidence is at the root of the child's difficulties. By proving to himself that he can do the thing he was afraid of, often by beginning at a lower and easier level, he gains confidence. Such fear-attitudes are often inculcated by the parents and sometimes by teachers. (Witness the mother who reiterates regarding her child's difficulty with arithmetic, "Why, I never was able to do arithmetic myself, so my child comes by it naturally.")

Wandering attention and inability to concentrate are frequent causes of school failure. A child who is running in the 25-yard dash has no difficulty in concentration.

Neither has the child who is working in a speed exercise. The habit of concentration can be formed by repetition, just as any other habit.

Lack of the necessary knowledge prerequisites has accounted for numerous failures. The Adjustment Rooms have frequently been criticized for "placing" a child too low in order to make a record. The fact that a child has been "over" the subject guarantees no mastery of it. To develop independence by self-help, it is necessary that all such weaknesses be eradicated.

Wrong attitudes toward work, such as laziness, "don't like the teacher," etc., have been overcome in all but a very few cases. The motivations are such as grip children of the earlier years. There is an objectivity about the work which brings the teacher and pupil to the same point of view, and the pupil soon begins to view the teacher as a helper and not as a critic.

THE ADJUSTMENT-ROOM TEACHER

Many teachers will not care for the methods of the Adjustment Room. There is nothing routine about it. Also, everything done must be registered in some way. The teacher who likes to "hang on to" the bright pupils because they are such a joy will be disappointed. The teacher who "just hates" to teach dull pupils will be equally aggrieved. The teacher who has learned, by years of unfortunate experience, to love the prim and orderly rows of dear ones, who whisper not, neither do they chew paper wads, and who are taught at great pains to stand just so and to hold the book at the proper level in the left hand, finds no good opportunity for the expression of her talents. The teacher of the

Adjustment Room must be specially trained *not* to occupy the center of the stage, *not* to gather a family around her and entertain them, *not* to coach, *not* to perform tasks for the pupils, *not* to occupy the time of the pupils with her own ideas. On the contrary, she must have full and free opportunity to devote herself to the discovery of particular educational and mental needs of the children, and to use her best judgment in the adaptation of school materials (or in the invention of others) to the satisfaction of those needs.

TRAINING THE ADJUSTMENT-ROOM TEACHER

Certificated teachers (graduates of a normal school or college) must learn how to make the group and individual tests, how to interpret them, and how they are standardized. They must also study the course of study and determine why each part and lesson of it has a function and just what its objective is. They must think of it as far as possible in terms of a child mind which is developing with an increasing self-control. They must learn the technique of teaching under the controlling thought that the pupil should *learn* and not *be developed*.

FUNCTION OF THE DEPARTMENT OF PSYCHOLOGY AND EDUCATIONAL RESEARCH

Teachers who are allowed to the department make waiting lists from which principals transfer the pupils to the Adjustment Rooms. These teachers conduct educational and mental surveys and follow these by individual examinations. They assist the Adjustment Room teacher in making special studies of difficult cases,

and by their wider range of experience and opportunity for comparisons are often able to give valuable advice as to methods of saving time and energy. They are "helping" teachers. The department also maintains a clerical staff for the standardization of the tests and setting of performance standards.

RESULTS IN TERMS OF SCHOOL PROGRESS

The Los Angeles schools now maintain 52 Adjustment Rooms and 26 Development Rooms (for feeble-minded). Over 3000 pupils have been enrolled in the Adjustment Rooms during the past two years. Of the first 200 pupils, the following figures will show something of the progress made by these pupils who previously were considered "misfits" in the grades:

5 per cent were returned to the grade after a short trial. In most of these the difficulty had been poor sight, absence, or ill health

2½ per cent were recommended to a Development Room as feeble-minded

92½ per cent were given instruction in the Adjustment Rooms for a period of time and then recommended to a grade

Median time in the room, 13 weeks

Median rate of progress, 4.35 weeks' work covered per week

To discover to what extent the weakness or backwardness had been corrected permanently, a report was asked as to the success of each child in the grade to which he had been sent. At the end of three months it was found that 30½ per cent could not be traced, but of the remainder, 90.4 per cent were reported satisfactorily prepared and making good progress. Of the next 500 children

2½ per cent were returned to grade, the difficulty having been due to ill health or absence

4 per cent were recommended to Development Rooms (feeble-minded)

For the remainder

Median time in room, 11 weeks

Median rate of progress, 4.3 weeks' work per week

A third of these could not be traced at the end of three months, and of the remainder, 93.4 per cent were reported as satisfactorily prepared and making good progress.

In another district of the city, 300 children are recorded as follows:

1.2 per cent were returned to grade

19 per cent were recommended to Development Rooms (feeble-minded)

For the remainder

Median time in room, 10 weeks

Median rate of progress, 4 weeks' work per week

At the end of three months, 19 per cent could not be traced, and of the remainder 94.5 per cent were reported as satisfactorily prepared and making good progress.

RESULTS IN CHARACTER FORMATION

A member of the board of education visited an Adjustment Room in a certain district, where the boys and girls of the room were for the most part juvenile court cases. He afterward quoted one of the members of the class as follows: "Aw gwan! Cut it out! I've only got three minutes till the bell rings and I've got to finish this Project!" There are some elements of character which present tests do not attempt to touch. Those who are in most intimate contact with the Adjustment Rooms are convinced that a new sense of values comes out strongly in the boys and girls who are forming habits and attitudes under these conditions. Is it too much to hope that when teachers become expert in the diagnosis and treatment of particular mental conditions, the dependent may become independent, the erratic

may learn self-control, the thoughtless may learn self-criticism, the slovenly of thought may become definite, the careless learn self-correction, and those who lack initiative learn to attack new problems with vigor?

And the best of it is that the pupils know what is happening to them. As one boy put it, "Gee! my teacher won't know me when I go back to the grades!"

THE LOS ANGELES ADJUSTMENT PLAN IN RURAL AND VILLAGE SCHOOLS

From April to June, 1920, the Los Angeles Adjustment Plan was given a trial in four one-room schools and one three-room school in Placer County, California. The experiment was made at the suggestion of Dr. Margaret S. McNaught, State Commissioner of Elementary Schools, was financed by the California State Board of Education, and was carried out by Miss Maud Whitlock of the Los Angeles city schools. Miss Irene Burns, superintendent of the Placer County schools, and the teachers in the schools chosen, co-operated in the experiment. All the actual instruction involved in the experiment was carried out by the regular teachers, with no help except in the three-room school, where a cadet teacher from San Francisco State Normal School assisted for a few weeks.

With the help of tests and the teachers' records on quality of school work, the pupils in each school who were behind in their studies were temporarily withdrawn from their regular class work, in some cases from part of it, in other cases from all of it, and were given the Los Angeles project materials for self-instruction in the various subjects in which they were most defi-

cient. All the pupils took to these materials with great zest, and most of them developed an entirely new attitude toward their studies. One boy, thought by his teacher to be a defective, proved to have an IQ of 107. This boy, who was exceedingly sensitive, shy, and lacking in self-confidence, made a gain of three terms in his oral reading. Standard tests given at the close of the experiment showed that surprisingly great progress had been made by nearly all the pupils. The following excerpts from the reports made by the regular class teachers speak for themselves.

"D. has been in the sixth grade for three years and has always caused his teacher a great deal of trouble. After the first day under the Adjustment Plan he was so interested that if any one tried to get him to do things in the old way he would pay no attention. He was anxious to see how many squares he could fill in every day in the Progress Sheets." (N. D.)

"The enthusiasm with which the pupils approach each new step makes the work a pleasure to the teacher and causes the child to progress more rapidly. So far there have been no problems in discipline, as each child is too busy and too interested to make mischief. It is quite common for a child to remark upon how quickly the time passes, or to show regret when recess or closing time prevents him from completing a project or taking up a new one. Interest in the work increased, rather than diminished, as the experiment proceeded. The pupils seemed to derive more pleasure in proportion to the amount of work they accomplished. They themselves made the request that they be allowed to work the last morning of school instead of having stories, so

that they might have more to show on their Record Sheets. Nearly all were anxious to know if the work was to be continued next year, and if they might be allowed to take it." (M. H. T.)

"Some advantages of the Adjustment Plan are: (1) Each pupil progresses at his own rate, according to his ability; (2) the definiteness of the outlines enables a pupil to proceed without losing time waiting for assignments; (3) pupils are taught to understand the use of graphs in keeping records of work accomplished; (4) the pupils learn to rely upon themselves instead of upon the teacher or classmates." (A. L.)

"I wish we might have had the work earlier in the year, for it is an excellent plan for rural schools. It gives such a thorough drill in the essentials and eliminates so much of the less necessary work that we are apt to spend so much time on. It dispenses with so many hasty recitations and helps the child to do independent work. The idea of being able to advance independently seemed to appeal to these children, and they all asked if we were to have the work next year." (M. B. H.)

All the teachers in their official report on the success of the experiment rendered judgments fully as favorable as those quoted above, and the value of the Adjustment Plan in small rural schools seems to have been demonstrated. This is hardly surprising, since it is precisely the one-room school enrolling all the grades that has the greatest need for methods of individual instruction.

CHAPTER FOUR

THE CONSERVATION OF TALENT

Raymond Hugh Franzen, Director of Educational Research, Des Moines, Iowa

EDITOR'S INTRODUCTION

Dr. Franzen's chapter will serve to remind the reader of the highly important fact that intelligence tests and educational tests should go hand in hand. Although this fact is taken for granted by educational psychologists, it is likely to be overlooked by the rank and file of educational practitioners. Dr. Franzen has made an important contribution in suggesting a practicable method of combining the results of mental and educational tests by the use of the Accomplishment Ratio, previously called the Accomplishment Quotient. We predict that the Accomplishment Ratio will become widely known and extensively used. (L. M. T.)

MENTAL INVESTMENT AND SOCIAL DIVIDENDS

EDUCATIONAL reorganization is everywhere aiming at such a classification of pupils as will reduce the individual differences of product to the inherited bases of these differences. We have been prodigal of the genius of our race. Our educational institutions and our methods of selection for important positions in the business and professional life of the country have proceeded in a haphazard way. Though the conditions making for success have been rigorous enough to insure that in the main our leaders were the upper half of humanity in intelligence,—or the top quarter, perhaps,—the methods were so crude that the top quarter of humanity has not yielded what it could. For every genius who has achieved in proportion to his capacity, probably two or more have been wasted. Education is partly responsi-

ble, for methods of education should include the selection and special treatment of supernormal children. Deviates in intelligence in either direction from the mean are equally out of place in a normal classroom; yet, although much work has been done in the segregation and special treatment of subnormal children, little if any consideration has been given the problem of the supernormal. Nature has made lavish investments in some nervous systems, investments which have never yielded proportional social dividends.

A plea for the recognition of the varying rates at which children progress through their school life should include a practical plan by which children may be classified, a consideration of the inherited and environmental factors which are the causative correlates, and proof that, when exactly classified, children do better work than when more roughly graded. It is easy to reason that brilliant children, when in an ordinary class, so easily achieve satisfactory records that indolence and bad conduct become resultant habits; it is easy to argue that children taught in a class in which all are of the same mental ability stimulate each other to more give-and-take, excite less envy and feeling of inferiority, and become more confident, ambitious, and intellectually courageous; but it is more necessary to show that children, when so classified, learn to read, write, and spell better, that they achieve more nearly what they are fitted by nature to do. The extent to which children achieve what they are mentally capable of can be measured, and we can give a verdict as to how far the schema of classification on the basis of such measurement as we now have is practicable.

SCIENTIFIC QUESTIONS INVOLVED

It is when viewing the matter from a scientific angle in an attempt to gain exact evidence, that vexatious questions interrupt an otherwise smooth propaganda. We must know:

- (1) What tests to use to classify;
- (2) How to use them;
- (3) Whether abilities in reading, spelling, and arithmetic or their predisposition exist as *special* abilities, or whether children differ in these simply because of their innate differences of intelligence.¹
- (4) Whether individual differences in ambition, interest, and industry, in so far as they influence accomplishment, are due to special tendencies or whether they are learned manifestations of a more general heritage.
- (5) How these proclivities, specific or general, are related to intelligence.

Points 1 and 2 are methods of procedure that must be evolved from our existent knowledge of measurements and statistics. Points 3, 4, and 5 are problems which must be solved from the evidence resulting from an experiment in classification using these methods. Points 4 and 5 introduce the vexed question of whether

¹ Whenever the word "intelligence" is used in this chapter, it will mean that quality of the nervous system which distinguishes bright from stupid. It is a characteristic of the nervous system irrespective of growth. Thus we may think of the timbre of the nervous system, its chemistry, as intelligence, and the amount of it as its growth. A child at ten has the same intelligence as he had at three, though he has attained greater mental growth by that time.

there is a "general factor" making for disparity in school product or some general cause other than intelligence. Should reading ability prove to be the result of certain inherited abilities, or predisposition to abilities, we could not use a measure of mental ability alone as the guide to what a child could attain in reading. If intelligence, however, were the only inherited prognostic factor of school achievement, we could mark the education which had functioned in the child's life by the percentage which the actual accomplishment of the child was of the maximum accomplishment of which he was capable at that stage of his mental development. So too, if interest and ambition are not mainly the result of rewards and punishments of early life but are themselves significantly rooted in the nature of the child, we could not condemn or commend curricula and methods upon a basis of the ratio of resultant accomplishment to mental ability but must include a measure of this potentiality. The practical queries whether or not a child can do reading as well as he does arithmetic, whether his ambition and his honesty have their origin in the *same* strength or weakness, can only be answered when these problems are fully solved. The immediate consequence of knowing that a child can usually be taught to read if he does other tasks well is of obvious import. It would be of great service, too, to know whether lack of application can be corrected so as to bring concentration to the level of the other traits. If a child is normal in other ways and not in his tendency to respond to the approval of others by satisfaction, can this drive be increased or reduced to the average or are individual differences in specific original tendencies

basic to development of character? And if they are, how much influence do these differences exert upon school accomplishment? In order to classify children and comprehendingly watch and control their progress, we must know the relation of achievement to the inherited bases upon which it depends. We must be able to state a child's progress in any one school subject in terms of the potential capacity of the child to progress. We must know the inherited determinants of disparity in school product.

CURRENT EXPERIMENTS IN RE-CLASSIFICATION

In the last year re-classification in terms of scaled tests, both of mental ability and of subject matter, has become an important issue in education. The school man of America has accepted the verdict of experimental evidence. His school has been convicted of heterogeneity, and he has accommodated his thoughts on the subject of school organization to the idea of more rigid demarcation of groups of any one mental ability and even of any one stage of development in reading or arithmetic. Too often, however, the problem has been considered too simply as classification by mental ability, by subject matter, or by a composite of the two. Too often, also, mental ability alone or measurement of one product has been considered an index of mental elements not included in the diagnosis. Our results all indicate that, for the present, re-grouping of children must be done both ways; that each child has an ideal grade in each subject, by virtue of the ability he has reached in that subject as well as an ideal section of that grade by virtue of intelligence; that grouping of chil-

dren must be done on two axes. Our results show further that if this is done all unevenness will disappear and each child's grade will become the same in each subject; that all disparity in product will reduce to individual differences in mental ability. But it is only by re-grading for spelling and for arithmetic that the high correlation between different kinds of product is discovered, since it is only in this way that remediable weaknesses are removed.

TESTS SHOULD THROW LIGHT ON THE INDIVIDUAL CHILD

Measurement should form the basis for teachers' opinion; it should neither supplant nor supplement it. A surveyor does not use one instrument to judge distance and then accept its result irrespective of all other data, such as known facts about the values investigated. He makes another measurement when his results conflict with other data. Neither does he use his instruments and then compare their result with his opinion formed independently, with the implied necessity of agreement. He bases his opinion on the results, including such other data as he has, and gets new facts until one interpretation explains all findings. We should do the same, not set up a test or a series of tests as the only criterion, nor measure and judge independently and then check one series against the other. We should use the test results as the very best data we have upon which to form our opinions, and continue measurement until we know. We rarely obtain a teacher's judgment before she has seen the tests, just because we hope that her judgment will be based on the results of the test.

To do this the results must be stated in terms of the individual child, since the average teacher at her present stage of training readily understands that two individuals in her class are far apart in accomplishment of any one kind, but may not understand in any way directly applicable to her cares and tribulations that the variability of measurements of an ability in her class is great in comparison with that of other classes, or even that the overlapping of ability between classes is very great. Further, in order to gain her support, after we have shown the wide disparity in a class, we must proceed directly in terms of this demonstration to the reclassification.

A METHOD OF SURVEY OF READING, LANGUAGE, AND ARITHMETIC

Instructions (of which the following are a slight modification) were outlined at Garden City, New York, in order to gain these advantages.¹

- I. Administer and score the following tests according to standard instructions. Give all tests to all grades above 3:

Woody-McCall Mixed Fundamentals Form I-T. C. Bureau of Publications, Columbia University, New York.

Alpha 2 Reading. Bureau of Publications, Columbia University, New York.

Visual Vocabulary (Thorndike Reading Scale), A-2, Series x. Bureau of Publications, Columbia University, New York.

Kelley-Trabue Completion Alpha. Bureau of Publications, Columbia University, New York.

Stanford-Binet (given by the author).

- II. Translate the scores into year-month indices of maturity by means of the following table. Assume rectilinear development; that is, that the amount of score which equals a devel-

¹ A fuller description of this experiment will appear as "The Accomplishment Ratio," in Teachers College Contributions to Education.

opment of one month is the same as the amount of score which equals the development of any other month. Then interpolation and extension are allowable. Use the table in this way: Find in the table the score made by a child (for instance in the Woody-McCall); find the age to which it corresponds, then call this age the Arithmetic Age of the child. For instance, if the score in Woody-McCall is 20, his Arithmetic Age is about halfway between 10 and 11, or 10 years, 6 months.¹

AGE	WOODY-MCCALL	ALPHA 2	VISUAL VOCAB.	KELLEY-TRABUE
8-0	12.00	4.50	3.60	4.30
9-0	15.16 $\frac{2}{3}$	4.98	4.32	5.00
10-0	18.33 $\frac{1}{3}$	5.46	5.04	5.65
11-0	21.50	5.94	5.76	6.35
12-0	24.66 $\frac{2}{3}$	6.42	6.48	7.05
13-0	27.83 $\frac{1}{3}$	6.90	7.20	7.70

III. Arrange these Arithmetic Ages of all the children of your school in order from high to low, with the names opposite the scores on the extreme left-hand column of the paper. At the right have parallel columns of the grades. Check the grade of each child in these columns. You will then have a sheet like this:

NAME	ARITH. AGE	GRADE							
		4		5		6		7	
		B	A	B	A	B	A	B	A
Gertrude Smith	180							#	
Saul Sampson	176					#			
Ed Jones	176							#	
George Calut	172								#
Ida Henry	172								#
Raymond Teller	172								#
Ed Hoard	172								#

¹ These norms were empirically derived.

Do the same with each of the tests. It is clear that if your school were perfectly classified, all the 8th-grade children would come first on each relation sheet and then the 7th-grade children, etc. You have now a picture of the overlapping of your grades. Divide your total number of children by the number of teachers available and then make a class division by the number of pupils; that is, call the upper one-fifth of the total number of pupils Grade 8 in this subject, the next one-fifth, Grade 7, etc. If all grades of arithmetic are taught at the same time and all grades of reading at the same time, you can now send each pupil to the grade in which he belongs in each subject.

- IV. Call each derived age a "Subject Age" (SA). Divide each Subject Age by the Chronological Age of the child. This will yield what may be called a Subject Quotient (SQ), previously called an Educational Quotient (EQ).¹ Dividing the Reading Age by the Chronological Age you arrive at a Reading Quotient. This RQ is the rate at which the child has progressed in reading. We have the same kind of quotient for intelligence (Stanford-Binet IQ). This IQ is the potential rate of progress of the child.
- V. The ratio of any Subject Age to Mental Age² may be called a Subject Ratio (SR), previously called an Accomplishment Quotient (Acc. Q.).¹

This Subject Ratio gives the proportion that the child has done in that subject of what he actually could have done, and is a mark of the efficiency of the education of the child in that subject to date. The goal is to bring these Subject Ratios as high as possible. When they are above .90, the child may be considered as receiving satisfactory treatment, providing norms for Subject Ages are reasonably accurate. (This figure, .90, applies to a Subject Ratio obtained by using a Stanford-Binet Mental Age.) An Arithmetic Ratio based on one arithmetic test and one intelligence test only is not as good as one based on three arithmetic tests and three intelligence tests. If Subject Ratios go far over 1.00, the

¹ See Raymond Franzen, "The Accomplishment Quotient," Teachers College Record, November, 1920.

² Or the ratio of the Subject Quotient to the Intelligence Quotient, which is the same as the ratio of the Subject Age to the Mental Age.

chances are that the Mental Age diagnosis is too low. The average of the Subject Ratios of a child may be called his Accomplishment Ratio.

In all discussions and tables that follow:

AQ means Woody-McCall Arithmetic Age divided by Chronological Age, and *AR* means this AA divided by Mental Age.

VQ means Thorndike Vocabulary Age divided by the Chronological Age, and *VR* means this VA divided by Mental Age.

RQ means Alpha 2 Reading Age divided by Chronological Age, and *RR* means this RA divided by Mental Age.

CQ means Kelley-Trabue Completion Age divided by Chronological Age, and *CR* means this CA divided by Mental Age.

SQ means any Subject Quotient—that is, any Subject Age divided by Chronological Age,—and *SR* means any Subject Ratio—that is, any SA divided by Mental Age.

EQ, the *Educational Quotient*, means the average of all Subject Quotients, and *AccR*, the *Accomplishment Ratio*, means the average of all Subject Ratios.

All *r*'s are product moment correlation coefficients uncorrected.

As the reliabilities are almost what the other coefficients are in June, 1920, it is apparent that the corrected coefficients would all be very near unity at that time.

ACCOMPLISHMENT

Tables 1 to 4 show what happened at Garden City as a result of this technique between November, 1918, and June, 1920. In tables presenting more of this in greater detail, for instance the correlations between IQ and SQ's with more cases and by grade, the same results are apparent. It will be seen by reference to Table 2 that the correlations between IQ and the Subject Quotients are appreciably higher for November, 1919, and June, 1920, than for the previous dates. Note, also, a remarkable increase in the correlation of IQ with AQ from November, 1919, to June, 1920. Re-classification is in my opinion responsible for about 90 per cent of

this increase in association between IQ and SQ's. The reliability coefficient of each set of quotients is over .85. Table 4 shows further that not only was the correlation increased, but the absolute magnitudes of the SQ's approached the IQ's also. The quantity $M_{IQ} - M_{SQ}$, which is the difference of averages, is mathematically the same as $\frac{\Sigma(IQ - SQ)}{n}$,

the average of the differences. This reduces toward zero. The same evidence as is presented there for arithmetic is apparent in the other subjects also.¹

THE NEGLECT OF GENIUS

Table 5 gives the intercorrelations of Subject Ratios. Mental ability does not constitute an element in the child's score because the Ratio expresses what proportion that, which a child has done, is of what he himself is able to do. A very brilliant child and a very stupid child both have the same chance to make a high or a low Subject Ratio, dependent upon the zeal with which they prosecute their school duties. The correlation of Subject Ratios therefore is an index of how far ability in one subject is associated with ability in another subject when intelligence is rendered constant.² The tendency to association is about .5 (see Table 5). At first sight this would seem to indicate the operation of some general inherited factor other than intelligence, some general proclivity which would influence children to invest as great a proportion of their mental ability in

¹ See "The Accomplishment Ratio," Teachers College Contributions to Education, in preparation.

² A use of the method of partial correlation with these data leads to the same conclusions indicated here.

TABLE I. THE GROUP WHICH TOOK ALL TESTS AT ALL PERIODS ARRANGED IN ORDER OF MAGNITUDE OF INTELLIGENCE QUOTIENTS (JUNE, 1920)

INTELLIGENCE QUOTIENTS	ARITHMETIC QUOTIENTS	VOCABULARY QUOTIENTS	READING QUOTIENTS	COMPLETION QUOTIENTS
146	111	154	164	150
142	129	135	137	136
141	109	118	107	121
139	124	141	124	134
138	101	112	105	106
138	121	130	110	109
130	107	139	135	136
122	127	130	124	121
122	113	121	117	124
122	112	102	114	129
121	128	125	128	128
120	100	116	102	119
118	117	123	114	125
117	131	111	118	124
117	106	122	112	111
114	105	126	110	114
109	83	113	117	103
107	103	112	95	103
107	94	126	94	123
104	99	117	96	104
104	103	110	94	116
103	108	113	112	106
101	100	114	109	106
100	90	103	92	92
100	109	118	108	113
99	114	104	106	110
99	114	119	117	115
98	102	101	108	104
98	99	106	107	106
97	95	109	107	105
97	108	101	102	105
97	95	104	89	110
96	90	104	91	91
95	84	99	93	100
95	90	107	99	105
95	85	117	114	103
94	106	57	89	108
94	103	103	106	104
92	96	86	94	85
87	83	88	92	87
87	95	96	94	102

TABLE 1 (*Continued*)

INTELLIGENCE QUOTIENTS	ARITHMETIC QUOTIENTS	VOCABULARY QUOTIENTS	READING QUOTIENTS	COMPLETION QUOTIENTS
84	85	87	93	87
83	106	91	87	104
80	77	91	80	84
80	84	75	79	84
80	89	107	88	86
78	87	90	93	85
60	69	56	71	77

one subject as another. Thus when a child does good work in reading he will tend to do good work in arithmetic, "good" meaning what his mental ability warrants. That might easily lead us to believe that children were endowed by original nature with different degrees of zeal, application, perseverance, or some such general factor other than intelligence.

However, the Accomplishment Ratio, an average of Subject Ratios, correlated with Intelligence Quotients $-.61$ in November, 1918, and $-.49$ in June, 1920. In other words the more stupid a child is the more he tends to get out of education *in proportion to his native ability*. It is hard to conceive that such a relationship exists by original nature; it is easy for us to explain the negative correlation between zeal and intelligence in terms of training received in our schools as they are now organized. This accounts fully for the intercorrelation of Subject Ratios with no necessity to appeal to a concept of a general inherited factor other than intelligence. A child who is stupid has Subject Ratios all of which are higher than those of a child who is bright. Hence a correlation exists between Subject Ratios.

TABLE 2. INTERCORRELATION OF ALL QUOTIENTS FOR ALL PERIODS OF THE
48 CHILDREN WHO TOOK ALL TESTS AT ALL PERIODS

November, 1918
(*n* = 48)

	IQ	VQ	RQ	CQ	S. D.	M
IQ	....	....	....	....	19.12	105.15
VQ	.72 ±.05	....	....	....	±1.32	±1.86
RQ	.64 ±.06	.64 ±.06	....	....	20.54 ±1.41	102.52 ±2.00
CQ	.63 ±.06	.71 ±.05	.77 ±.04	....	19.09 ±1.31	95.90 ±1.86

June, 1919

	IQ	VQ	RQ	CQ	S. D.	M.
IQ	....	....	....	....	19.12	105.15
VQ	.73 ±.05	....	....	....	±1.32	±1.86
RQ	.65 ±.06	.58 ±.06	....	....	20.80 ±1.43	113.54 ±2.02
CQ	.62 ±.06	.68 ±.05	.77 ±.04	....	14.73 ±1.01	101.31 ±1.43

November, 1919

	IQ	AQ	VQ	RQ	S. D.	M.
IQ	....	....	....	....	19.12	105.15
AQ	.46 ±.08	....	....	....	±1.32	±1.86
VQ	.86 ±.03	.23 ±.09	....	....	14.08 ±1.18	102.90 ±1.37
RQ	.65 ±.06	.56 ±.07	.71 ±.05	....	17.07 ±0.96	109.17 ±1.66
CQ	.79 ±.04	.47 ±.08	.83 ±.03	.82 ±.03	13.91 ±1.21	101.42 ±1.35

TABLE 2 (*Continued*)

June, 1920

	IQ	AQ	VQ	RQ	S. D.	M.
IQ	....	....	....	....	19.12	105.15
					± 1.32	± 1.86
AQ	.73	....	....	....	14.10	101.79
	$\pm .05$				± 0.97	± 1.37
VQ	.81	.60	....	....	18.89	108.94
	$\pm .03$	$\pm .06$			± 1.30	± 1.84
RQ	.79	.68	.87	....	16.43	104.94
	$\pm .04$	$\pm .05$	$\pm .02$		± 1.13	± 1.60
CQ	.84	.77	.78	.84	15.87	108.08
	$\pm .03$	$\pm .04$	$\pm .04$	$\pm .03$	± 1.09	± 1.54

TABLE 3. INTERCORRELATION OF ALL QUOTIENTS IN JUNE, 1920. ALL CHILDREN EXCLUSIVE OF GRADE 3 ARE HERE REPRESENTED

	IQ	ARITHMETIC QUOTIENT	VOCABULARY QUOTIENT	READING QUOTIENT
Arithmetic Q....	.733	....	....	....
Vocabulary Q....	.837	.628	....	....
Reading Q....	.758	.694	.734	....
Completion Q....	.821	.770	.825	.801

The P. E.'s are all less than .05

n = 81

Then the ratio of accomplishment to mental ability is in definite relation to brightness, a negative relation. It is this same tendency to adapt our educational procedure to a low level which has prevented a perfect association between mental ability and accomplishment in the various subjects. We are allowing the subnormal to be at the frontier of his abilities and are sacrificing the supernormal's chances in order to do it; and the normal children, too, on a basis of this correlation would seem to be getting less than they could if classification were added to our educational procedures.

This serious maladjustment of conditions of educa-

TABLE 4. SUMMARY OF PROGRESS IN ARITHMETIC BY INCREASE IN r_{IQ-AQ} ,
DECREASE IN $M_{IQ} - M_{AQ}$ AND DECREASE IN DIFFERENCE OF STANDARD
DEVIATIONS (NOVEMBER, 1919, TO JUNE, 1920)

GRADE	r_{IQ-AQ}		AVERAGE INTELLIGENCE QUOTIENT MINUS AVERAGE ARITHMETIC QUOTIENT		DIFFERENCE OF STANDARD DEVIATIONS (OF IQ AND ARITH. Q)	
			Nov.	June	Nov.	June
3	.413	.709	19.25	8.16	6.27	6.63
	$\pm .16$	$\pm .08$	± 2.87	± 2.05	± 2.04	± 1.45
4	.426	.725	7.41	0.46	2.39	0.47
	$\pm .10$	$\pm .06$	± 1.84	± 1.50	± 1.29	± 1.02
5	.698	.713	16.14	-0.54	7.14	2.06
	$\pm .07$	$\pm .07$	± 1.93	± 1.84	± 1.37	± 1.30
6	.533	.805	11.00	3.00	0.19	1.63
	$\pm .13$	$\pm .06$	± 2.01	± 1.19	± 1.42	± 0.85
7	.740	.795	7.27	0.62	14.03	8.15
	$\pm .09$	$\pm .07$	± 3.58	± 2.33	± 2.53	± 1.63
8	.663	.796	11.92	14.93*	5.26	8.53
	$\pm .11$	$\pm .07$	± 2.25	± 2.69	± 1.59	± 1.54
Total	.576	.686	14.67	3.72	3.51	1.16
	$\pm .05$	$\pm .03$	± 0.94	± 0.81	± 0.67	± 0.57

tion, this waste of nervous capacity, is unfortunate in an age when we are in great need of leaders, inventors, research scientists, and artists. We are neglecting the upper octile more seriously than any other portion of the scale of brightness, although it is rather through these than through a higher average intelligence that civilization is advanced. The degree of adaptation of instruction to the individual is in inverse ratio to the degree of brightness of the individual. This is probably true of nearly all school systems. Our knowledge of

*This increase is undoubtedly due to the fact that most of the eighth graders reached the limit of the test before June, 1920. Their Arith. Q's were in reality much higher than the test could register and therefore the quantities $IQ - AQ$ were in reality smaller than was registered.

TABLE 5. INTERCORRELATIONS OF SUBJECT RATIOS

RATIOS	NOV., '18	JUNE, '19	NOV., '19	JUNE, '20
Arithmetic with Vocabulary.....	....	....	.60 ± .06	.30 ± .08
Arithmetic with Reading.....	....	....	.70 ± .04	.64 ± .05
Arithmetic with Completion.....	....	....	.48 ± .07	.61 ± .05
Vocabulary with Reading.....	.34 ± .08	.32 ± .09	.57 ± .06	.47 ± .07
Vocabulary with Completion.....	.45 ± .07	.36 ± .08	.53 ± .06	.54 ± .06
Reading with Completion.....	.61 ± .06	.65 ± .06	.67 ± .05	.67 ± .05

existent school arrangements bears out the testimony gained at Garden City.¹ Segregation of feeble-minded, special classes for the mentally deficient, special methods of teaching "deviates" taught at normal schools, books on the psychology of the subnormal, all these are familiar; but there are few provisions for similar emphasis upon the needs of those who deviate in the other direction from the mean. We are just beginning to pay attention to this group.² They are just as much out of place in an ordinary classroom. There is one marked difference in results. Whereas we may to some extent combat criminal tendencies by special treatment of the

¹ Using the better technique of S. D. locations in an age group instead of Subject and Mental Ages, Mr. A. J. Hamilton of Berkeley, California, has negative correlations this same size between Subject Ratios and his brightness measures. R. Pintner has the same results, in this consideration, from an entirely different approach: "Results of the Combined Mental-Educational Survey Tests," *Journal of Applied Psychology*, Vol. 12, No. 2, 1921, pages 82-91.

² Lewis M. Terman, *The Intelligence of School Children*, Houghton Mifflin Company; Guy M. Whipple, *Classes for Gifted Children*, Warwick and York.

subnormal, we shall increase our leaders by special treatment of the supernormal. The one is preventive, the other is provocative. The first reason seems the more potent. Preventive measures always seem more immediate to administrators even though the debit value of the prevented catastrophe is much smaller than the credit value of an innovation which does not so much to correct any immediate trouble as to inaugurate new and fertile prospects.

WHOLESALE RE-CLASSIFICATION NECESSARY

In all other details the educational misfortunes of a curriculum and method not fitted to capacity are equal for both series of maladjustments. Whereas the subnormal child does not know what is going on and becomes restless, begins to cheat, troubles the teachers, and in some cases becomes openly rebellious, the supernormal child is bored and becomes restless and troublesome also, often developing a hatred and contempt of everything having to do with study. The one becomes sullen, the other conceited; the one tends to become an anarchist, the other "peculiar"; the one tempts criminal adventure, the other drifts into the life of a dilettante; they both tend to lose ambition, concentration, and initiative, all because the methods of study and the curricula are not adapted to individual differences.

The children of neither group are certain of developing the moral stamina necessary for good citizenship, nor do they form good habits of study or accumulate such information as they might. Being aware of this discrepancy between the gift and the recipient, we have made our lessons easier and have segregated the lower

percentile. There is much more to be done. We must adapt education to at least five varying classes in order to reduce the spread within each to a commodious span. But the genius is the most important and consequently has the greatest claim to our immediate attention.

Experiment and the current of educational opinion point a prophetic finger toward classification. The experiment at Garden City proves that the association between IQ and Subject Quotients can be brought to almost unity, and therefore that any amount of classification in terms of accomplishment in subject matter is not only justifiable but imperative in order to reduce all disparity in any one age group to these unremovable individual differences which may be expressed as IQ.¹ A school which has been perfectly classified for two or three years will have groups all of the same age and of the same potential rate of progress, whose difficulties in arithmetic, spelling, and reading are of the same general level. This will afford the opportunity for enrichment of the curriculum to the degree essential and will make unnecessary any rapid promotion. Each class can stay in each grade one year. While one class will learn much there, another will learn little, because nature has been more generous in the neural endowment of the one than of the other.

¹ Or, one is equally justified in saying, any amount of classification on the basis of intelligence is justifiable. The reader untrained in statistics may not easily grasp the import of Dr. Franzen's results. The main conclusion, however, should be clear; namely, that when children are properly adjusted and properly taught, their school accomplishment corresponds very closely to their intelligence. In other words, *general intelligence is the thing that determines what progress a child in a particular school subject should make*. Hence the importance of intelligence tests. THE EDITOR.

CHAPTER FIVE

THE USE OF INTELLIGENCE TESTS IN THE SCHOOLS OF A SMALL CITY

C. R. Tupper, Superintendent of Schools, Miami, Arizona

EDITOR'S INTRODUCTION

The author of this chapter would be the last to offer his experiment as in any sense a specific guide to others situated like himself. It does contain, the editor believes, valuable suggestions of what may be done immediately by the superintendent of any small city, in the improvement of school classification. Certainly it is unnecessary to wait until ideal methods of adjustment have been worked out. The field is one in which widespread experimentation is desirable along various possible lines. Indeed, only as the result of such experimentation can the best methods of reorganization be evolved. The future trends of our educational development will be determined in no small degree by superintendents like Mr. Tupper who have the initiative and courage to break away from the beaten path and to seek better ways of doing things. (L. M. T.)

MIAMI is a mining town of 10,000 population situated in the heart of the copper district of Arizona. The school system enrolls some 1500 pupils, 50 per cent of whom are of Mexican nationality. An excessive retardation rate led to a systematic investigation to determine methods of cutting down this important human and financial waste. The usual methods were first employed. Classes were reduced to 30 or 35 pupils, the standards for teachers were raised so as to exclude all having less than two years' professional training, salaries were increased to attract the best teachers, a bonus was offered to summer-school attendants to encourage professional study, the largest over-age pupils were put in special classes, the best of primary and special supervisors

were secured, a full-time attendance officer was employed, and physical examinations were given to all children and many defects were remedied through treatment.

A specialist in pedagogical and intelligence tests was then sought, and Miss Mildred Thomson, of Stanford University, was secured to inaugurate our program of diagnostic testing. Group intelligence tests were given to all children from the second to the eighth grades; individual Binet tests were applied to the first grades and to a large number of selected individuals. The results of the tests were worked up in graphic form on large charts in colored inks, so as to show mental and chronological ages together with IQ's. These charts then became the object of study in an effort to find the answer to "What next?" From this study the following facts became evident:

1. There was practically no real retardation. The children who were chronologically retarded were in reality accelerated beyond their mental age. In general, those retarded the most, chronologically, were accelerated to the highest degree beyond their mental ability.

2. The extreme variations in mental age in the same class-group were strikingly evident, one sixth-grade group showing mental ages ranging from 8 years to 15.

3. This same wide range of mental ability was evident in classes in the same grade, suggesting at once the possibility of re-grouping children without making it necessary to change their grade classification in the least.

4. Some few individuals stood out above their class

so strikingly as to indicate the advisability of immediate investigations looking toward the skipping of a grade.

5. Many of the over-age pupils showed a stage of mental development which at once indicated the uselessness of trying to force them through the regular course of study.

6. The class-groups in one school with a 90 per cent Mexican enrollment lagged consistently behind corresponding classes in the other schools in their stage of mental development.

7. Statistical investigation in elimination of pupils, carried on simultaneously with the mental survey, indicated the heavy mortality among these pupils, especially in the fifth and sixth grades. Still further study disclosed the fact that practically all these pupils dropped out of school one or two years before reaching high school.

Several definite conclusions were at once deducible from these facts. It was evident that the wide mental age range in many of the classes made successful class work impossible and contributed directly to failures and retardation. The range of individual differences in some classes made them in reality "ungraded groups" rather than groups with a homogeneous mental development capable of profiting from class methods of instruction. The frequent inclusion in class-groups of children with a mental development two or three years below the normal standard for the grade indicated that the work of the regular course of study was unsuited and unprofitable to them, and bore witness to the fact that many children had been promoted from

grade to grade largely on the basis of chronological age alone. The consistent lagging of the Mexican groups behind other class-groups indicated the necessity of a specialized curriculum for these children, especially since it was evident that scarcely any of them ever reached the high school.

These facts having been established through the mentality survey of the schools, definite steps were taken to modify the school organization along the lines indicated by the results. Care was taken to proceed slowly in order not to arouse the antagonism of teachers or school patrons through a radical introduction of new-fangled methods. The steps taken were as follows:

1. Two heterogeneous first-grade classes were re-grouped on the basis of Binet tests, thereby reducing the mental age-range from 4-10 (i.e., 4 years, 10 months) and 4-4 to 2-1 and 2-10, respectively. All children in one group were above 6 years mentally, all children in the other group were just 6 years mentally or below, although in every case they were 6 or more years of age chronologically. The difference in school capacity between these two groups has been marked. The better group is making better than standard progress, and 11 of the pupils in it are now receiving special coaching for a "skip."

2. Two 5-B classes were re-grouped partly on the basis of the results of the National Intelligence Tests and partly by teacher conferences and individual test results. Both groups contained 8-year mentality prior to the change, with median mentality of 9-0 and 9-1 and with mental age-ranges of 4-5 and 3-10, respectively. Re-grouping reduced the age-ranges

to 3-5 and 0-9, while the mental medians shifted to 9-10 and 8-3. One of the new groups was made up of mental ages ranging from 8 years to 8 years and 9 months. This latter group is obviously not a fifth-grade group. It still retains that name, however, in order not to discourage the pupils through demotion. The work of the class is being simplified to suit the group capacity. For these particular pupils the class designation carries little significance, as they are hopelessly retarded chronologically and will drop out of school as soon as the legal age limit is reached. The IQ of this group ranges between 60 and 80 on the basis of the group tests, thereby indicating the improbability of any of them ever succeeding in high school should they attempt to enter.

3. A high fifth and a low sixth class were re-grouped at the close of the semester into two sixth-grade classes. In this case the high fifth class evidenced a higher mental development than the low sixth. The best pupils from each group were placed together, and the slower pupils also were grouped. Both classes then went by the same name in order to avoid the discouragement caused by the demotion which really took place among the slower pupils. Prior to regrouping, the mental age-ranges were 5-3 and 3-11, with median mentalities of 10-2 for the high fifth and 9-7 for the low sixth. Subsequent to re-grouping, the mental age ranges were reduced to 1-9 and 2-6, while the median mentalities shifted to 11-2 and 9-1. The lower group is now made up largely of over-age pupils close to the compulsory age limit who will automatically drop out of school within a year or two. They constitute a

fairly homogeneous group which can be given work suited to their ability instead of being compelled to drag along in a group in which they are unable to compete successfully.

4. Two heterogeneous 7-B groups were similarly reclassified. Median mentalities prior to re-grouping were 13-5 and 13-9, with mental age ranges of 5-7 and 5-2. Subsequent to re-grouping the medians shifted to 11-10 and 15-4, while the age ranges were reduced to 2-6 and 2-8, thus giving "classes" instead of "mixed ungraded" groups.

5. Two 8-B classes were re-grouped in the same manner, thereby allowing the more advanced section to make up a half year of time.

6. Two high sixth classes were also re-grouped, with the result that the better class is saving a half year while the slower group is finding it difficult to finish the required work of the grade on time.

7. Several individuals standing out from their classes on the group tests were given special individual tests and allowed to "skip" grades.

8. Two Smith-Hughes classes for girls and two Smith-Hughes classes for boys were selected and grouped through the use of Binet tests, in order to provide groups of pupils of as nearly equal development as possible.

9. Results of the tests which showed the consistent lagging of the Mexican groups behind other groups, when considered in connection with elimination statistics for these pupils, formed the basis for the action of the school board in deciding to equip the new Mexican building with a view to emphasizing industrial and

home-making courses for these children. The superintendent was sent to other school systems in the state to observe methods and means of providing practical industrial and home-making training for Mexican classes. As a result a definite program looking to the inclusion of this work in the Mexican schools was adopted by the board and will be provided for in the equipment of the new \$125,000 Mexican building.

All re-groupings were initiated as a result of the intelligence tests, but in every case conferences were held with teachers before the final placing of pupils. In no case was a pupil demoted as a result of the tests, in spite of the fact that the results indicated that some pupils had been promoted considerably beyond their ability. The aim throughout was the identification of pupils capable of making more rapid progress, and the formation of groups of pupils showing approximately the same stage of mental development. The objective was continually the formation of real "classes" in place of the heterogeneous groups of pupils which are the inevitable result of haphazard grouping or grouping based solely on subjective teacher judgment. The new groups show a mental age range of less than three years in nearly all cases, and should be able to profit far more by "class methods" than the old groups with age ranges as high as 6 to 8 years were able to do. The percentage of failures in these groups should be less, since the range of competition has been narrowed and pupils are competing for success with other individuals possessing more nearly the same mental age level.

The retardation statistics for the system indicated that the work being offered in the schools was not

adapted to many of the classes and to many of the individuals in those classes. The intelligence survey demonstrated that the heterogeneity of the class groups with respect to mental development would not permit of efficient classroom teaching unless pupils were re-grouped. Re-grouping on the basis of mental age is providing the necessary homogeneous classes, while a new course of study which lists minimum essentials, supplementary work, and suggested extensions, and which provides for special classes and special work in industrial and home-making groups, is making possible the adjustment of the work to the ability and needs of the classes which have been selected on the basis of mental capacity, whenever this could be done without demotions.

A "selling campaign" was put on subsequent to re-grouping, in order to make the program "stick." Questionnaires were sent out to all teachers, asking their opinion on the changes made and on the use of tests in general. All papers were made anonymous in order to insure frank opinions and open criticism. The results were compiled and a general teachers' meeting called to consider the situation. It was shown by means of charts based on teachers' estimates of intelligence of certain classes that the subjective judgment is especially unreliable when used in connection with the estimation of the intellectual ability of children. This fact was still further emphasized by displaying large charts showing the results of well-known experiments on the ability of teachers in grading papers. The opinions of leading educators were quoted in order to acquaint teachers with the trend of expert opinion. An effort

was made to impress the fact that the new method is not infallible, but that it *is* a decided improvement over older methods, is becoming more and more widely used, and that it is a part of every teacher's professional duty to become familiar with the nature, purpose, and use of tests. It was also emphasized that this method of grouping children aids the teacher in her work by providing a homogeneous group instead of an "ungraded group" with an excessive range of mental ability, and that the method affords slow children a much better chance to succeed by removing them from unfair competition with children possessing a far higher mental development.

The public press was supplied with articles collected from various sources showing the advantages of the new method and the possibility of cutting down failures through its use, and thereby effecting a very considerable saving, both financial and human. Accounts of the work undertaken were sent to the superintendents of several of the Western cities and to the educational authorities of various universities. A request was made for an expression of opinion in connection with the movement being introduced. The replies were published in the papers and formed the basis for still further explanations regarding the purpose and possibilities of the tests. The subject was also taken up before the town Rotary Club. All changes made were explained and illustrated by the use of colored charts. The advantages of the method over older methods were emphasized and expert opinion was quoted in support of the movement. The school board was constantly kept closely in touch with all plans and phases of the

work, the advantages and possibilities of the method being continually emphasized and backed up through expert opinion.

The result has been the definite adoption of the method and a steady support of its application by the school board, the teaching staff, and a large majority of the community. It is confidently felt by the school administration that it will at last be possible to attack the retardation problem in the Miami schools on a scientific and fact basis. It is felt that the underlying causes have been located and that the solution of the problem is well under way. The program adopted calls for a careful selection of groups of children with "homogeneous mental development" as determined by intelligence tests modified by teacher conferences; the diagnosis and standardization of these groups by the use of pedagogical tests; and the application of a flexible and diversified course of study adapted to class groups. The formation of the course of study is well under way and is being rapidly carried forward by means of teacher-committees in collaboration with highly trained supervisors. Special classes have been formed and more will be formed, but it is felt that the aim should be "every class a special class," a homogeneous group of children personally conducted by the teacher on a tour through the system, accomplishing minimum essentials as defined in the course of study, "checking up" on essentials through standardized tests, but always allowing wide leeway for supplementary work as indicated by the personnel of the group. This aim seems to be dictated by the shifting nature of the school enrollment and by the wide diversity in ability, mental development,

character, social position, and previous training of the cosmopolitan enrollment in the Miami schools.

It is of course realized that practice will fall short of the aim, but it can be unquestionably shown that the indicated procedure is reducing and will still further reduce the percentage of failures and the percentage of retardation in the local schools. It can be conclusively shown that the indicated program is going far toward fitting the curriculum and the organization to the child in place of forcing the child to conform to the system or forcing him out entirely. It can be likewise demonstrated that the program offers opportunity to a large percentage of the children in the Miami schools to secure a fundamental and functioning training in industrial and home-making skill which is denied to them under the traditional system. When it is recalled that the children of the Mexican laborers in the mines of the district almost invariably drop out after the sixth year to take up unskilled manual labor or to set up homes of their own, it will be readily appreciated that the schools owe it to these children to provide them with definite training in this direction in place of condemning them to failure, discouragement, and early elimination by confining their school training to the traditional course of study looking toward high school entrance and graduation.

CHAPTER SIX

SIGNIFICANCE OF MENTAL TESTS IN CORRECTIVE AND ADJUSTMENT CASES

REPORT OF EXPERIMENTAL WORK WITH POOR SPELLERS
AND NON-READERS, WITH APPLICATIONS TO NORMAL
CHILDREN

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EDITOR'S INTRODUCTION

Work of the kind described in this chapter will always be of great importance, whatever plan is followed in the classification of children in general. Individual cases of maladjustment and of specific disability will always be with us. The editor knows of no one who has made more significant contributions to the better understanding and treatment of spelling and reading disabilities than Dr. Fernald. Unfortunately, she has published but little regarding the methods of diagnosis and treatment she has worked out as the result of several years of research in this field.² It is to be hoped that this summary statement may be followed in the not too distant future by a more detailed account of the interesting experiments Dr. Fernald has made in this line. (L. M. T.)

THE writer has for some time conducted investigations for the purpose of determining the characteristics of children of normal mentality who fail in specific school subjects or who show abnormalities in the learning process, and for the purpose of discovering means by

¹ The report of the spelling experiments and particularly of the methods used in class work is given in the *The Teacher's Manual of Spelling*, California State Textbook Series, State Press, 1918. The report of the work with non-readers is to appear shortly in the *Journal of Educational Research*. The experiments with the first work in reading and writing have just been completed and will be published within the next few months.

² For a somewhat fuller statement of her results with non-readers see *Journal of Educational Research*, November, 1921.

which the development of such children may be made normal. Only extreme cases of failure in specific school subjects were studied.

The initial work in the case of both reading and spelling consisted in a thorough mental and educational testing of each child. If the educational tests verified the school report of failure and the mental test showed normal mentality, further tests were given the child to discover, if possible, the reason for his failure. Each case was then followed up with instruction in the subject or subjects in which the child was failing. Finally, class experiments were performed to determine whether the methods which worked with the child who had difficulty in a given subject could be applied to an ordinary class with satisfactory results.

EXPERIMENTS WITH POOR SPELLERS

Four hundred poor spellers have been studied during the last eight years. A third of these were adults or high school students, and the rest were children in the grades. All were individuals of normal or superior mentality who were extremely poor spellers.

The main peculiarity found in the majority of these cases was lack of visual imagery. In some cases the difficulty seemed to be that, although the attention of these children had been called repeatedly to the visual image of the word, they were unable to visualize. That is, the child had his attention called to what was, at best, a vague, unstable image and so had no definite idea of the word as soon as the stimulus had been removed. In other cases the child had been trying to learn words by saying the letters over repeatedly to himself.

The reason why this latter method of learning words is not favorable for the child whose imagery is primarily auditory or kinæsthetic is given in the following paragraph.

It is obvious that the only image of the word as a whole which the non-visual child is able to get is either the auditory image of the word as pronounced or the lip-or-hand kinæsthetic (motor) image of the word. Oral spelling, which has been commonly supposed to benefit the child whose imagery is auditory or motor, actually obliterates the only image of the word the child is able to get. That is, the child cannot pronounce the word to himself and at the same time say the letters of the word. As soon as he begins to say the letters, the image of the word as pronounced is lost.

In a few cases we found a child with visual imagery who was a poor speller. In these cases the difficulty seemed to be lack of attention to the image the child was able to get clearly. These children learned very rapidly as soon as attention was directed to the visual image.

The remedial treatment consisted (1) in eliminating oral spelling or any form of repeating letters while learning the word, and (2) in having the child say each syllable to himself as he wrote it. The child may have to say the letters in the case of non-phonetic words or parts of words. He soon develops the ability to size up a word and see at a glance whether he can write it as he pronounces it. It takes a little time and patience to get the poor speller out of his old habits and started on the process just described, but he requires no individual attention after the start is once made.

In all cases in which the work was continued over a sufficiently long period the spelling was entirely corrected. The length of time required seemed to depend on the extent to which the incorrect habits had been established. Children in the lower grades picked up the correct writing of words rapidly and, after a few writings of a word, seemed to have no tendency to write it incorrectly. Older children and adults seemed to learn new words quite as rapidly as younger individuals, but showed a much greater tendency to revert to old erroneous habits. Attention to the word was necessary for a much longer period in the case of older students. This is, of course, what would be expected, as the more fixed a habit has become the more the energy required to establish a substitute habit. Some of our most successful cases, however, were those of adults or high school children who discovered that they could write words correctly by the methods described and who persisted until the new habits were established.

The essentials for the correct spelling of a word seem to be:

1. *Correct perception of the word.* The child must see the word and pronounce it. It is especially essential that the child have the visual stimulus of the word before him as long as necessary to form a clear image of every part of it.

2. *Attention to the type of image a child can get most clearly.* For the auditory child, this would mean saying the syllables plainly to himself, except in the case of non-phonetic words, in which case it may be necessary to say the letters.

3. *Writing the word while the image is clear in con-*

sciousness. The child may be able to write the word correctly if his attention is on the word but quite unable to do so if he is thinking of something else. Consequently it is necessary for him to think the word while he is writing it the first few times.

4. *Writing the word correctly a sufficient number of times so that a habit is established.* It is particularly essential that the child shall not be put in a position where he is compelled to write a word incorrectly during the habit-forming process. The rapid dictation of words of whose spelling the child is doubtful forces the child to write the word incorrectly and tends to establish habits of incorrect spelling. It is essential that the child should be able to go back to the perceptual process as often as necessary for the correct writing of the word. If he is allowed to look at the word whenever he is doubtful of its spelling but not allowed to copy it, the process of writing the word correctly will soon become automatic. It was found to be practically impossible to get poor spelling in the upper grades corrected unless teachers allowed the child to write as slowly as necessary in order to spell every word correctly. A few weeks under these conditions usually gave the desired results.

EXPERIMENTS WITH NON-READERS

In a series of class experiments, it was found that the methods which proved effective with the poor speller could be used in general classes without interfering with the learning process of other children. The details of the plan for doing this are given in *The Teacher's Manual of Spelling*, California State Textbook Series.

During the last five years seven cases of non-readers

have been brought to our attention. Only those children were considered non-readers who were normal according to mental tests and yet were unable to read monosyllabic words after at least three years in schools of good standing. In two cases the children were unable to read or write their own names, although every effort had been made to teach them. The intelligence quotient in all these cases was over 90 by the Stanford Revision, in three cases over 100 and in one case over 140. The chronological ages ranged from 9 to 12 years.

Although only seven cases have been studied to date, the similarity in their behavior suggests a common characteristic. All these children seem to be dependent on kinæsthetic experiences for the development of word recognition. The failure to learn to read seems to be due to the absence of adequate motor expression in the beginning work in reading.

The method used with these non-readers was the result of chance observations in connection with the work in spelling. One boy of eleven who had been sent us from the first grade and who was unable to read or write monosyllabic words finally learned to write several words after tracing them many times. It was found that he was able to recognize these few words in print. Other words were worked out in the same way with the same result. After six months the boy was reading so easily that further special work was no longer necessary. He is now (after five years) doing good work in the eighth grade of the Los Angeles city schools.

The following method, worked out in connection with this first case, was successful in all six of the other cases. A word was written in crayola on stiff paper.

The child traced the word with his fingers as many times as he wished to do so. He then wrote the word without looking at the copy. In all but two cases it was necessary for the child to trace the first few words many times before he was able to write them. As soon as the child was able he stopped tracing the word and wrote it after looking at the written word and saying it over to himself. Finally he was able to learn the word from the printed copy and to recognize it after he had studied it without writing it. He was then given practice in the apperception of phrases and in silent reading.

Each of these children has learned to read, all but one fluently, after six months of special work, and all but the last two cases undertaken have gone into the regular grades corresponding to their chronological ages. All are doing satisfactory work in these grades. The development seemed to take place in four distinct phases, as follows: (1) It was necessary for the child to trace the word in script and write it before he was able to recognize it on later presentation. (2) He was able to write the word without tracing it provided it was written and pronounced for him. (3) He was able to write the word after seeing it in print and having it pronounced for him. (4) He was finally able to recognize words without writing them provided they were pronounced for him, and to pronounce new words which resembled words he had already learned.

EXPERIMENTS WITH READING AND WRITING IN THE CASE OF FIRST-GRADE CHILDREN

The final series of experiments was made in connection with the first work in reading and writing in three

different schools and followed the general plan of the work already described, except that no formal content was given to the child. From the start the work was entirely spontaneous and individual and yet carried on with classes of the average size.

The child began his written work by asking for any word he wished to learn. The teacher wrote this word for him on cardboard with crayola. The child traced the word as many times as he wished and then wrote it on the blackboard without looking at the copy. After learning a few words in this way, the child began to write sentences, asking for any new words and learning them by the method just described.

Before the year was over all the children were able to look at a new word, pronounce it, and write it, tracing only in cases of especially difficult words. Their writing vocabularies were much more extensive than those of children in the second and third grades of the same school, and they tended to write much more complex compositions. Although a word was never copied, there was almost no misspelling. There were no failures of promotion in any of the classes in spite of the fact that one room was made up entirely of children who were unable to go into the regular first grade on account of some handicap, such as illness, late registration, or supposed deficiency. In this class a third of the children skipped at least half a year.

Experiments of this kind have convinced the writer that the methods described for the treatment of poor spellers and non-readers have much to offer for the improvement of present-day methods of teaching normal children to read and spell.

In closing, it is necessary to emphasize the value of mental and educational tests in the diagnosis of children's general and specific difficulties and in checking up the results of treatment. Without the use of test methods such extreme individual variates as those here described are often likely to be misunderstood and our remedial measures are compelled to proceed largely in the dark.

Test Notices

*Especially designed for use in high schools
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By LEWIS M. TERMAN

Professor of Educational Psychology, Stanford University; joint author of the National Intelligence Tests and of the army mental tests; author of the Stanford Revision of the Binet-Simon Scale, and of a number of books on the measurement of intelligence

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By M. E. HAGGERTY, L. M. TERMAN, E. L. THORNDIKE
G. M. WHIPPLE, and R. M. YERKES

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